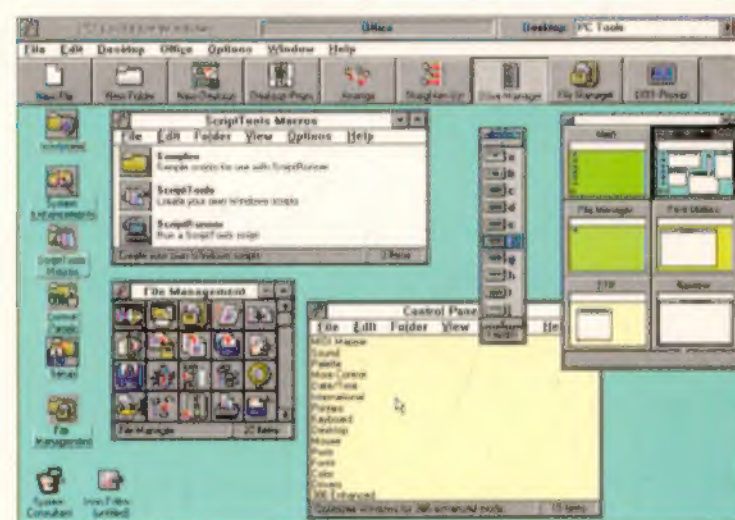


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Electronic Tools
For Writers: Good
Enough to Polish
Up Your Work?



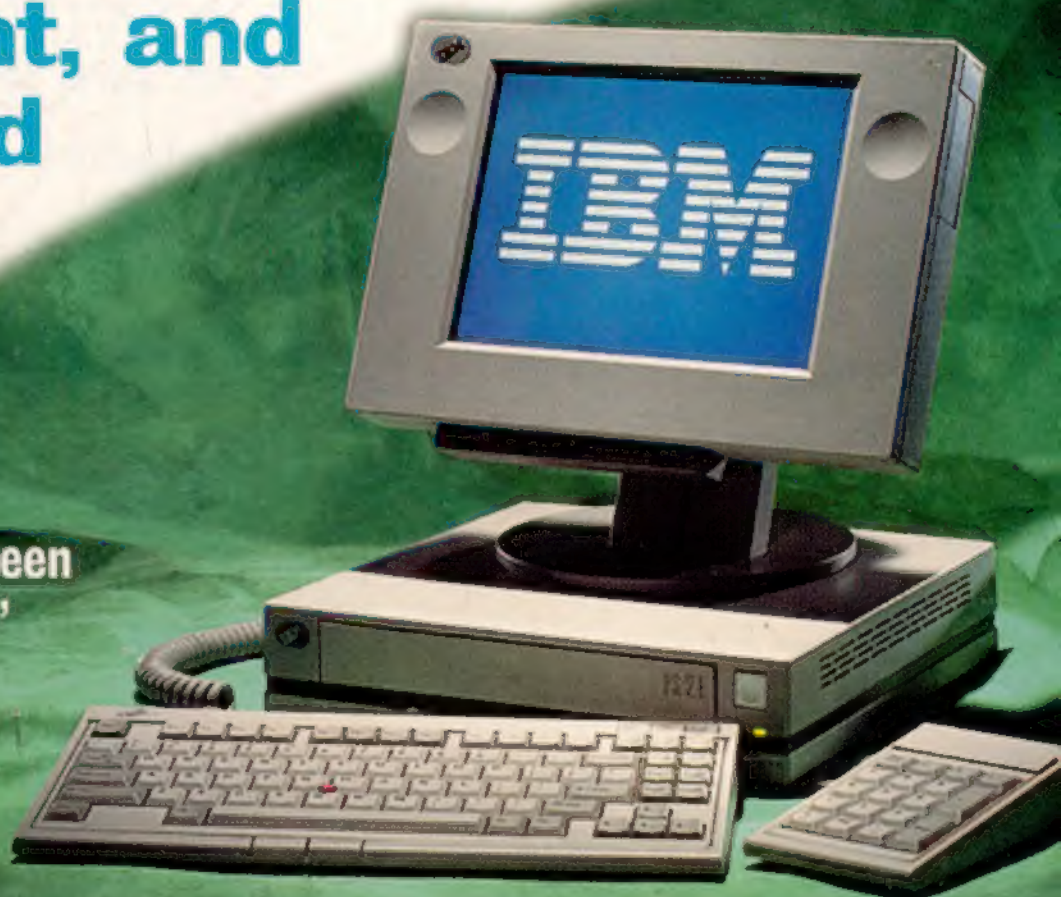
First Looks: PC
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MAGAZINE

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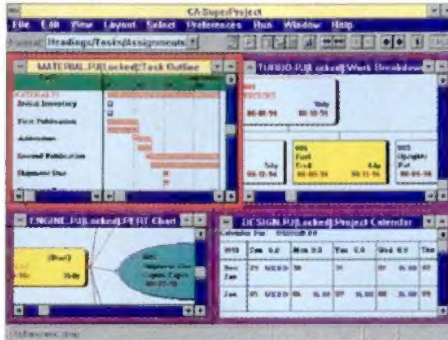
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Inside

The phrase "politically correct" has been used and misused so often in the last few years that, like any cliché, it has nearly been stripped of meaning. The original usage was to indicate conformity to prevailing views. In

an industry that changes as quickly as the computer industry does, consensus is a fragile thing. But concern about the ecology has transcended political labels and begun to penetrate the consciousness of even the most self-absorbed manufacturers.

While colors have long been associated with the industry (IBM blue, Novell red), green has taken on a new meaning. Our cover story, "The Green Machine," looks at the belated, but welcome, efforts of computer makers to play a part in preserving our planet.

This is not as absurd as it may sound at first. The EPA says that 30 to 40

percent of users keep their computers on all the time. Nifty screen savers do nothing to conserve power. Laser printer cartridges, repeated copies, and excessive software wrapping all add to our mountain of garbage.

The Green Revolution has triggered some innovative thinking. Last year, we gave a technical excellence award to Kyocera for its Ecosys laser printer, which includes a drum and cartridge that last the life of the printer. This year, there are many prom-

ising new products: low-energy PCs and monitors that use a fraction of the power of standard machines; keyboards that reduce the likelihood of painful wrists,



IBM's "Green Machine" is a prototype of the environmentally aware PC.

desks and chairs that may look absurd but may protect you from injury.

In doing this story, we took our ecology seriously. We tested monitors for radiation, measured the power usage of computers and peripherals, and reported on the efforts of companies to make computing not just faster but safer. This trend is not just a welcome change, but one that shouldn't cost you any more than you pay now for those resource hogs.—Joel Dreyfuss

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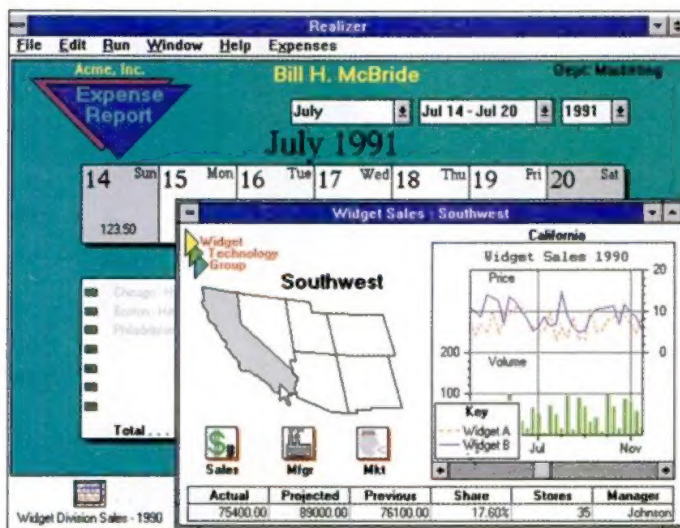
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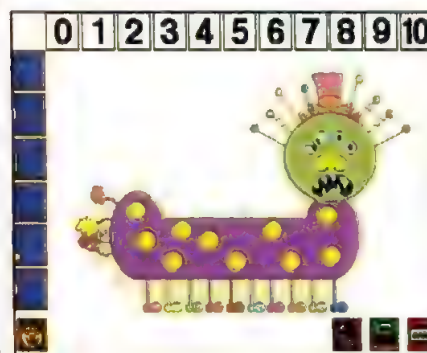
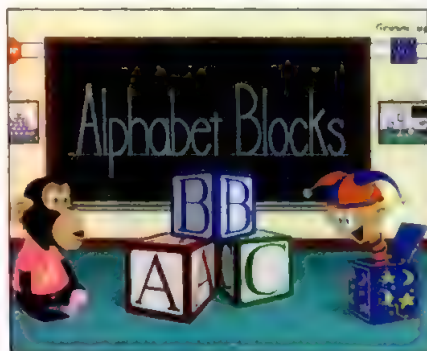


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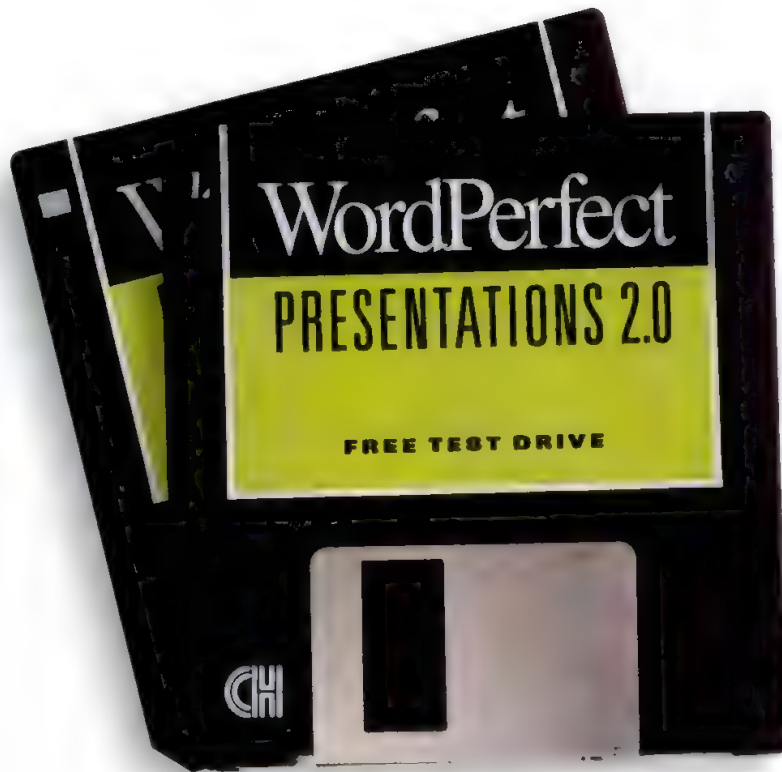


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PC Magazine Reviews

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COMPARE THE NEW HONEYWELL MOUSE TO ALL THE OTHERS.

Microsoft Ball Mouse.



Logitech Ball Mouse.



Cheap Ball Mouse.



Honeywell
Mouse
(No Ball!)

**It's Different. It's Better.
It's The Last Mouse You'll Ever Need To Buy.**

It's Almost Unfair To Compare. Our new technology is so advanced it virtually makes other mice obsolete.

Compare the accuracy. A ball mouse picks up dust and dirt that can roll up and contaminate the internal mechanism, which makes your cursor jump around the screen.

Our unique design keeps the mouse free of debris, so your cursor goes precisely where you want it - when you want it - forever.

Compare the ease of use. The Honeywell mouse doesn't need a special pad; it works perfectly on any surface - at any angle - even upside down!

Compare the quality, reliability and price. Proven Honeywell quality and fewer parts make our mouse extremely reliable. So reliable, we back it with a limited lifetime warranty.* And, our simple design allows it to be competitively priced with mice using out-of-date ball technology.

So, compare all of the other mice. But do yourself a favor and try a new Honeywell mouse - you'll see why it's the last mouse you'll ever need to buy. We guarantee it.

The Honeywell mouse is Microsoft[®], Windows[™], and DOS compatible, and works with IBM, compatibles and PS/2 systems.

For information on where to get the new Honeywell mouse call us at 1-800-445-6939. In Canada, call (416) 293-8111.



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CIRCLE 216 ON READER SERVICE CARD

Honeywell Inc. Keyboard Division, 4171 N. Mesa, Bldg. D, El Paso, Texas 79902 1-800-445-6939.

*See warranty for complete details. © 1993 Honeywell Inc. All product names are trademarks of their respective companies.

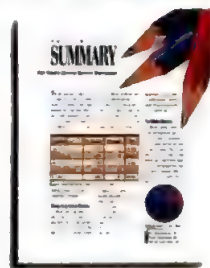
The Way Works Forces Yo

Introducing Claris

All works software claims to be integrated. But just try working with one. You'll find yourself switching back and forth from module to module. Cutting and pasting as you go. It feels anything but integrated.

That's why we designed ClarisWorks™ for Windows to perform like a single application. With word processing, spreadsheet, database and graphics tools all easily at hand. So you can move effortlessly from one set of tools to another. Without jumping from one screen to another.

Stewart Alsop's *P.C. Letter* said "If you want a glimpse of what the future



"Instead of opening separate applications to create a worksheet and write a letter, ClarisWorks puts a single document on the screen." *PC Computing*—March 1993

\$99* Special Introductory Price. See Your Claris Dealer.

In Canada, call 1-800-668-8948 ext 48. Available in Canada for \$119 C.D.N. *Offer valid only until 8/1/93. May not be used with any other special offer. ©1993 Claris Corporation. All rights reserved. Claris is a registered

All Other Software u To Work.

Works for Windows.

holds look no further than ClarisWorks for Windows...the seamlessness with which a user can move from task to task suggests a new class of 'multifunctional' software."

PC Computing advised "If you're considering an integrated Windows program this is it...all the features of other integrated packages such as Microsoft Works for Windows...built around the best and most advanced user interface we've seen in this class of program."

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CIRCLE 178 ON READER SERVICE CARD

Feel The Information.

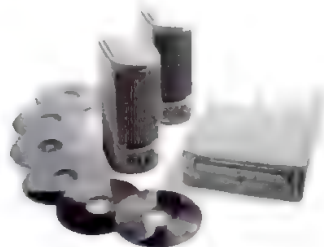
It's all around you. See it, hear it, watch it move, all at the same time. With the Desktop Library, a complete CD-ROM multimedia kit for your PC.

It's a learning tool that lets you hear the music as you read about the composer, witness historic events in video clips and stereo sound, and explore some of the great wonders of the world.

It's also a valuable business tool, giving you access to thousands of CD-ROM titles, from census data to medical journals.

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Sony Desktop Library



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CIRCLE 071 ON READER SERVICE CARD

Protection From Things You Can't Even See.

In Mr. Magoo's case, what he can't see covers lots of territory. For the rest of us, it includes things like invisible electronic emissions.

The more electronic equipment you work with, the greater the concern. That's why some monitor manufacturers offer models with VLMF (Very Low Magnetic Field) features. And charge extra for them.

But not Samtron. We were among the first to offer VLMF on our monitors. And now we build it into every advanced monitor.

For this, Samtron's extra charge is zero.

Another thing you won't see on these monitors is

flicker. That's because they're built with non-interlaced technology.

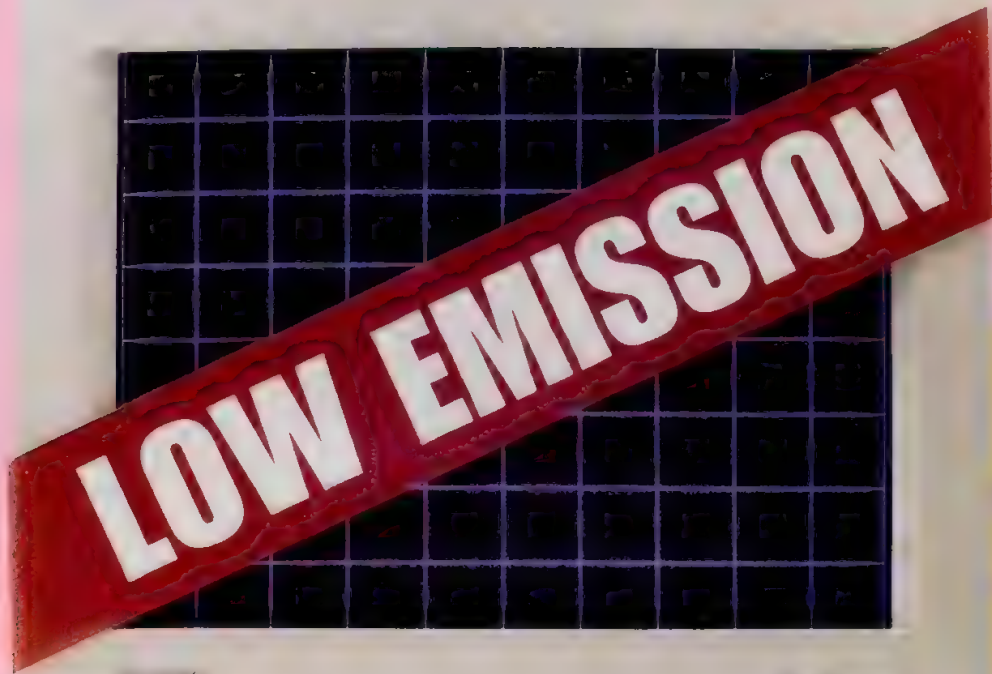
It's a difference even Magoo can appreciate. Take our new flat-screen 15" color monitor (SC-528DXL), for example. Together with a fine-grained 0.28 dot pitch and 1,024 x 768 high resolution, it gives you a picture that is not only steady, but crisp and clean.

The same can be said of our economical 14" color monitor (SC-428TXL).

Both are VGA and VESA compatible.

As we said, they all come with VLMF. Plus something else worth looking for.

The reliability of the Samtron name.



He needs all the help he can get.

SC-528DXL (15")

Advantages
Anyone
Can See

SAMTRON

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Letters

BOUGHT ANY SOFTWARE LATELY? MAYBE.

I found Michael Miller's piece, "Bought Any Software Recently?" (March 16, 1993), very interesting. It's always been my feeling that if software publishers would lower their prices to a level that the majority of end users felt was fair value, the piracy issue would disappear. Bring the price down to where average buyers, not just corporate giants, feel they're getting their money's worth, and they'll buy the product instead of copying someone else's. Come on, software publishers! Wake up and tap into the millions of us who would *love* to buy your products!

Steve Vanetti
Middletown, New Jersey



"If software publishers would lower their prices, piracy would disappear."

I enjoyed your review of antivirus software but was surprised that you didn't include the McAfee suite of programs. It couldn't be because the products are shareware, since you mentioned other shareware programs.

Ron Lesser
Baltimore, Maryland

• Many antivirus vendors have multiple products. When a vendor had multiple offerings, we picked one—their commercial offering. This left out McAfee Viruscan (we reviewed Pro-Scan) and F-Prot (we reviewed F-Prot Professional). We also inadvertently left Integrity Master out. These three products will appear in an upcoming First Looks.—Ed.

SPAGHETTI: NOT JUST FOR DINNER ANYMORE

Judging from his column, "OOP: Borland's Uphill Battle" (March 16, 1993), Jim Seymour has spent some time with the Borland barbarians. Perhaps this explains why he reaches the wrong conclusion with such supreme confidence. OOP is *not* the answer to "spaghetti" coding practices. The answer is structured, modular programming, and it's been around for decades. Now, instead

of "spaghetti code," programmers create "spaghetti objects"—pieces of code that derive their behavior from a multilevel inheritance tree. Tracking the source of mutant behavior in a fifth- or sixth-generation object is like finding one leaf among the branches of an oak tree.

Much of OOP is existing concepts and techniques dressed up in new terminology with just enough new stuff to make it the ultimate marketing tool for selling language compilers and books, fleecing Wall Street investors, obtaining research grants, and leading contributing editors to inept conclusions.

Ernie Deel
Marietta, Georgia

TALKING LANs AND WANs: ANOTHER VOICE

Thank-you for your timely article, "Making the WAN Connection: Linking LANs" (March 16, 1993). Indeed, a study by Arthur Andersen Consulting found network integration to be the top concern of MIS executives. You did a nice job of presenting three alternatives—circuit switching, leased lines, and packet-switching networks—but many people in the consultant community feel that Infonet's services were underrepresented.

As a niche player, mainly serving multinational corporations, Infonet has set the standard for international network providers with its InfoLAN network, using TCP/IP and Cisco routers in 18 countries. It currently services almost 50 customers supporting over 200 LANs.

Doug Laurin
Marketing Manager, Infonet Corp.
El Segundo, California

DEBUGGING THE DEBUGGERS

Thank-you for including Periscope in your review of debuggers, "The Art of Debugging" (March 16, 1993). Although generally accurate, the article had some errors (bugs?) that I would like to clarify.

The article refers to our product as Periscope/EM, but goes on to describe two different Periscope products. For the record, Periscope/EM does not require any hardware and sells for \$295. Peri-

A BUG IN THE ANTIVIRUS STORY

You reviewed 24 antivirus programs in your article "Antivirus Software: Keeping Up Your Guard" (March 16, 1993), but the software we use, McAfee Associates' Viruscan, was not among them. Why?

K.E. Davies
San Diego, California

Galen Gruman
San Francisco, California

Oblivious to the exploding SUPERNOVAS above, an AST engineer sits *Glued* to her PC.

Understand it's not that our people suffer from a lack of free time. It's just that they would rather spend their free time perfecting PCs. Obsessive? Perhaps. But it's from this commitment that our latest high-performance system was born. Our Premmia™ computer is the



result of customer research that we conduct worldwide to find out exactly what people want in a PC. As a result, it boasts a local bus design that delivers outstanding video performance. In short, a PC that's perfect for today's — and future — Windows™ applications. The Premmia

system is just one of the reasons that businesses in over 100 countries look to us for PC-based solutions. And with results like that, we honestly don't mind missing a streaking comet or two. Discover how our obsession can meet your PC needs. Call 800-876-4AST.

AST. COMPUTER
The Product Of Our Obsession.

POWER

Intel 486SX/33, 486DX/33,
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second-level cache available.

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Local bus video, with
1MB memory supporting full
32-bit, 486 operation.
Optional 2MB delivers 64-bit
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Five EISA slots. Five drive bays.
Up to 128MB memory.
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Flash BIOS for "service free"
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Multiple password levels,
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patent-pending Walk-n-Lock – which
invokes password protection after
a period of inactivity.

VISION

Parks Astronomical Telescope
with an equatorial mount and 80mm
refractor. All optional, of course.



LETTERS

scope Model IV is the hardware-assisted product that includes a trace buffer board that captures the system's execution history in real time. Both products support the 386 debug registers as well as other breakpoints. Contrary to your listed system requirements, Periscope/EM runs on anything from an 8088 on up, and Model IV runs on 286, 386SX, 386DX, 486DX, and 486DX2 systems.

Brett Salter

*President, The Periscope Company
Atlanta, Georgia*

WHAT DO YOU THINK OF SOFTWARE UPGRADES?

"Betaware Version 3.0299" ("Letters," March 16, 1993) really hit home. Borland suckered me into upgrading to Paradox 4.0 on the premise (promise?) that I would get the Windows version at a special rate. Now that they've offered it to everyone for \$139, they seem to think I should have no complaint. But I didn't really need Version 4.0; I bought it to secure my upgrade path to the Windows version. The bottom line is that I paid twice as much for my Windows version as the new Paradox customer. Although Paradox for Windows is excellent, you won't see me on the next upgrade bandwagon.

Dave Farmer

Redmond, Washington

In "Betaware Version 3.0299," Larry Chalcraft complained about the cost of upgrades. I don't know what his experience has been or with which companies he's dealt, but I've had some good experiences. Recently I called Microsoft and ordered upgrades for Word for Windows and Excel. Both were delivered by Federal Express, as promised, and the cost of all this was nothing! Free! There's plenty of complaining going on out there: It's time to give some compliments.

Don Sperline

La Mirada, California

ROOKIE COLUMNIST GARNERS PRAISE...

Kudos to Bill Howard for an increasing rarity in PC publications: a *one-page* col-

umn that deals with real issues, such as local-bus video and notebook computers. In this age of 500-page magazines in which every article tries to cover every conceivable slant on its topic, Bill Howard's columns are refreshing. They're concise, filled with useful insights, and written at a level most PC users can easily digest. More stuff, less fluff.

Gary Coker

Dothan, Alabama

*In this age of 500-page
magazines in which every
article tries to cover
every conceivable slant on
its topic, Bill Howard's
columns are refreshing.
More stuff, less fluff.*

...AND CRITICISM

In his column "Universal Confusion" (February 9, 1993), Bill Howard suggests that universal icons on PCs are too confusing and that they should be replaced with English words. This would certainly resurrect the "Ugly American" syndrome. The rest of the world is using universal icons in every aspect of life. Maybe Mr. Howard is too lazy to learn a few signs. I wonder how he survives when he travels!

Daniel B. Michaud

Hull, Quebec, Canada

"LAB NOTES" AUGMENTED

Regarding "Demystifying CONFIG.SYS in OS/2, Part 2" ("Lab Notes," March 16, 1993), I feel that the importance of using the Shutdown option in the Desktop menu can't be overemphasized. Even with lazy-write turned off, some writing back to the hard disk occurs during shutdown. The user must wait until all disk activity ceases before powering off or rebooting, or they can end up with a clobbered hard disk. Because of frequent power outages in the area where I live, I run with lazy-write turned off. I would

recommend this to anyone who is in a similar situation.

Leland C. Sheppard

Placerville, California

BETTER THAN CEMENT SHOES

I would like to extol the virtues of cement blocks as PC stands. We used to have a problem with the cleaning service's vacuum cleaner hitting our tower PC. Then we put it up on an eight-inch concrete block with openings through which cables can be routed, and it makes a great heat sink. Furthermore, it matches our decorator carpeting perfectly.

James K. Condon, M.D.

Schenectady, New York

A BIG BLUE SERVICE REVIEW

In many of your reviews of IBM products, you state that in addition to the hardware, the customer is buying the service and product support IBM has become famous for. I believe that IBM service and support has deteriorated and should no longer be used as a factor when deciding to pay more for Big Blue's hardware.

Christopher Brown

Kalaheo, Hawaii

CORRECTIONS AND AMPLIFICATIONS

In the chart depicting Graphics Winmark test scores for the Diamond Viper VLB and the NDI Volante Warp 10LB ("First Looks" March 30, 1993), the results were reversed. Diamond scored 27.5, and NDI scored 10.4.

SMJ Electronics, makers of the Cache Port, ("New & Improved" April 13, 1993) has changed its telephone number. The new number is 510-672-3885.

HOW TO WRITE TO PC MAGAZINE

We welcome your comments and suggestions. Please send correspondence to Letters, *PC Magazine*, One Park Ave., New York, NY 10016-5802, or upload it to PC MagNet (see page 12 for access information). All letters become the property of *PC Magazine* and are subject to editing.



Introducing PacificPage 4. The latest addition to a very prominent family.

The latest member of the award winning PacificPage® family has arrived. Called PacificPage 4, it's designed just for the new LaserJet® 4 printer.

Like all of its earlier family members, PacificPage 4 provides full PostScript® language emulation. The same 35 Apple® LaserWriter® scalable typestyles. And all of PostScript's powerful graphics capabilities. It also accepts downloaded Type 1 and 3 font formats.

Just install the SIMM module into any of your printer's memory slots. With 4 MB of additional printer memory, PacificPage 4 can print your PostScript output at an impressive 600 dpi resolution. You'll get sharp, crisp output that you'd expect only from an expensive, high-end PostScript device.

And your PostScript files will be printed quickly because PacificPage 4 utilizes the i960™ processor built into each LaserJet 4.

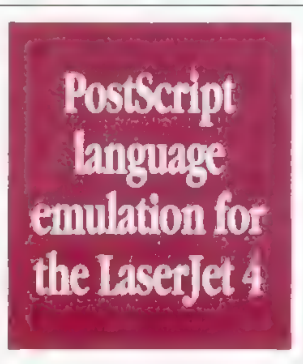
If your printer is on a network, you never have to worry about confusing the printer with PCL and PostScript files.

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Like all of the PacificPage products before it, PacificPage 4 is covered by a full lifetime warranty and is backed by a 60-day money back guarantee of satisfaction.

With all of these impressive features and capabilities, you'll be surprised to learn that PacificPage 4 is priced at a low \$299. Although, if you're familiar with PacificPage 4's predecessors, you know that high quality and low price run in the family.

For the dealer nearest you or to order PacificPage 4, call (619) 625-3617, Fax (619) 552-0889.



Be sure to ask about Pacific 4 SIMM Memory™ — 1, 2, 4, and 8 MB memory upgrades for the LaserJet 4.



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PACIFIC DATA
PRODUCTS

**386SL CONTENTA
PACKAGE I:**

\$1495

- CPU: Intel 386SL
- Processor Speed: 25MHz
- Memory: 2MB expandable to 10MB
- Hard Drive: 80MB
- Display: VGA backlit, 640x480, .23mm dot pitch, 256K video RAM, Sharp 7.4" diagonal, up to 64 shades of gray
- Battery: NiMH; operating time up to 4 hours; a snap to remove
- Size: 9.7" x 6.1"
- Weight: Only 3.9 lbs.
- Power Management: Fully featured, including Deturbo, Standby and Suspend to disk
- Keyboard: Comfortable 80-key with embedded numeric keypad
- I/O Ports: 1 serial and 1 parallel standard; ports for optional internal modem, external 3.5" floppy and external color VGA or SVGA monitor
- Pointing Device: Easy-to-use built-in trackball
- Warranties & Guarantees: ZEOS award-winning 24-Hour Toll-Free Technical Support, 30-Day Absolute Satisfaction Money-Back Guarantee, complete Customer Satisfaction Package

**386SL CONTENTA
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We take Pkg. I and upgrade to 4MB RAM, add an external 3.5" floppy drive, DOS, Windows and Lotus Organizer!

**386SL CONTENTA
PACKAGE III:**

\$1995

All of pkg. II plus a nylon carrying case, extra battery, and internal 9600/2400 baud fax modem. The whole enchilada for less than \$2000!

Your ZEOS[®] Now with 386SL

"...if you're looking for a subnotebook and want to make next to no compromises, then the \$1495 ZEOS Contenda is your best bet."

—PC Week, February 1, 1993

PC Week calls the ZEOS Contenda "the best yet of the new crop of lightweight, full-featured machines." We weren't satisfied with "best yet"—so we've made it *even better*. Because now you get your choice of a 386SL or 486SL CPU!

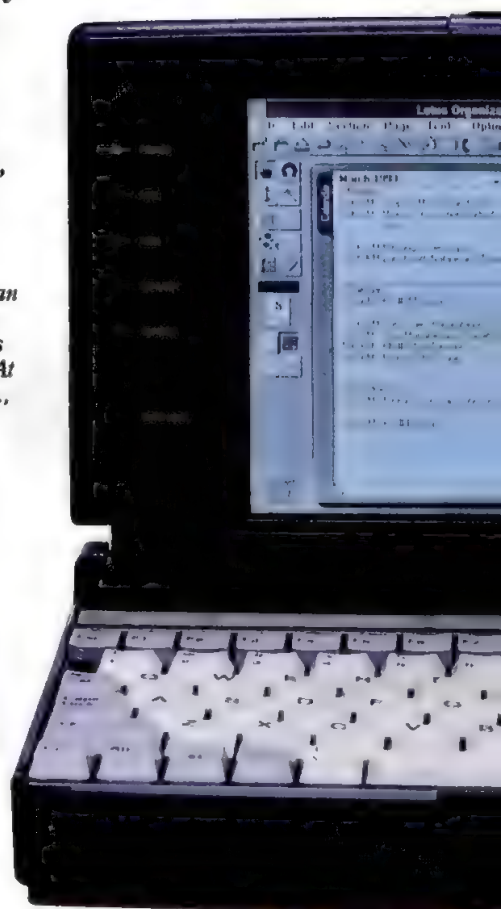
FEATURES THAT PULL NO PUNCHES.

Start by checking out the 386SL. The specs are on the left. It's impossible to find a notebook on the market today that's this light, this small, this affordable—and still gives you *so much power*. But it's all here.

For instance, there's the smart SL processor. According to PC Magazine, when it comes to notebooks, look for Intel's SL processor. The ZEOS Contenda's CPU extends your battery life significantly—because it's intelligent enough to power-down the memory, disks, modem and more when they're not in use.

What's more, its features make it a pleasure to use. Such as a crisp, vibrant VGA backlit screen. A built-in track ball. Enough power and memory to easily run Windows. And at less than 4 pounds in weight, it's probably lighter than your briefcase!

Smaller than a notebook, powerful as a desktop. At only 3.9 lbs., the ZEOS Contenda keeps you light on your feet.



Contenda:TM or 486SL CPU!

486SL OR 386SL:

IT COULD BE THE ONLY PC YOU'LL EVER NEED!

The 486SL gives you everything the 386SL version does, plus a few choice enhancements: 3.3 volt technology for added battery life, extra video RAM, PI local bus for Windows acceleration, and a high-speed floppy drive controller.

Take your pick. You'll find both Contendas give you the power and room for practically everything you'd use in a desktop system. You can easily run DOS, Windows and Windows applications. *And you can get all three*—including the new Lotus Organizer—the personal information manager that's so easy to use, it could make your Day Timer obsolete. Check out our upgrade packages for details. Then give us a call!

YOU GET CUSTOMER SUPPORT THAT'S THE BEST IN THE BUSINESS.

Our relationship with you doesn't end once we ship your Contenda. ZEOS pioneered comprehensive customer support, and it's what keeps our customers coming back again and again. We back all of our products with Toll-Free Technical Support, 24 hours a day, 365 days a year.

And we guarantee your satisfaction. If you're not absolutely convinced your new ZEOS Contenda is everything we say and more, you have a full 30 days to return it to us for a complete, no-questions-asked refund. Plus, you're covered by our One Year Limited Warranty and much more. You're going to be very satisfied. *We guarantee it!*

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- Memory: 4MB operating at 3.3v
- Hard Drive: 80MB
- Display: VGA backlit, 640x480, .23mm dot pitch, Sharp 7.4" diagonal, up to 64 shades of gray
- 512K 3.3v video RAM
- Local bus video controller operating at 3.3v
- Battery: NiMH; operating time up to 5 hours with power management
- Size: 9.7" x 6.1"
- Weight: Only 3.9 lbs.
- Power Management: Fully featured, including Deturbo, Standby and Suspend to disk
- Keyboard: Comfortable 80-key with embedded numeric keypad
- I/O Ports: 1 serial and 1 parallel standard; ports for optional internal modem, external 3.5" floppy and external color VGA or SVGA monitor
- Pointing Device: Easy-to-use trackball
- Warranties and Guarantees: ZEOS award-winning 24-Hour Toll-Free Technical Support, 30-Day Absolute Satisfaction Guarantee, complete Customer Satisfaction Package

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You get all of Pkg. I, plus external floppy, DOS, Windows and Lotus Organizer!

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We upgrade Pkg. II to 8MB of RAM—and add a custom-fitted nylon carrying case, additional battery and fax/modem. Perfect for road warriors!

The only notebook with a tilt & swivel display. Great for sharing data or keeping it private. Easily adjusts for perfect viewing.



This fine Italian leather carrying case is an additional option. Loaded with pockets and features every one will appreciate.



Digital brightness and contrast buttons make screen adjustment so easy.

Incredible ZEOS® Notebook. Incredible Price: \$1495!

THE ZEOS FREESTYLE/SL. NOW MORE AFFORDABLE THAN EVER!

To try and compare the new ZEOS Freestyle/SL to any other notebook is next to impossible. Because nothing else has all its features. And even with all these great features, nobody can match its incredible new price. Features and price. It would seem the new ZEOS Freestyle/SL is the best of all worlds. It is.

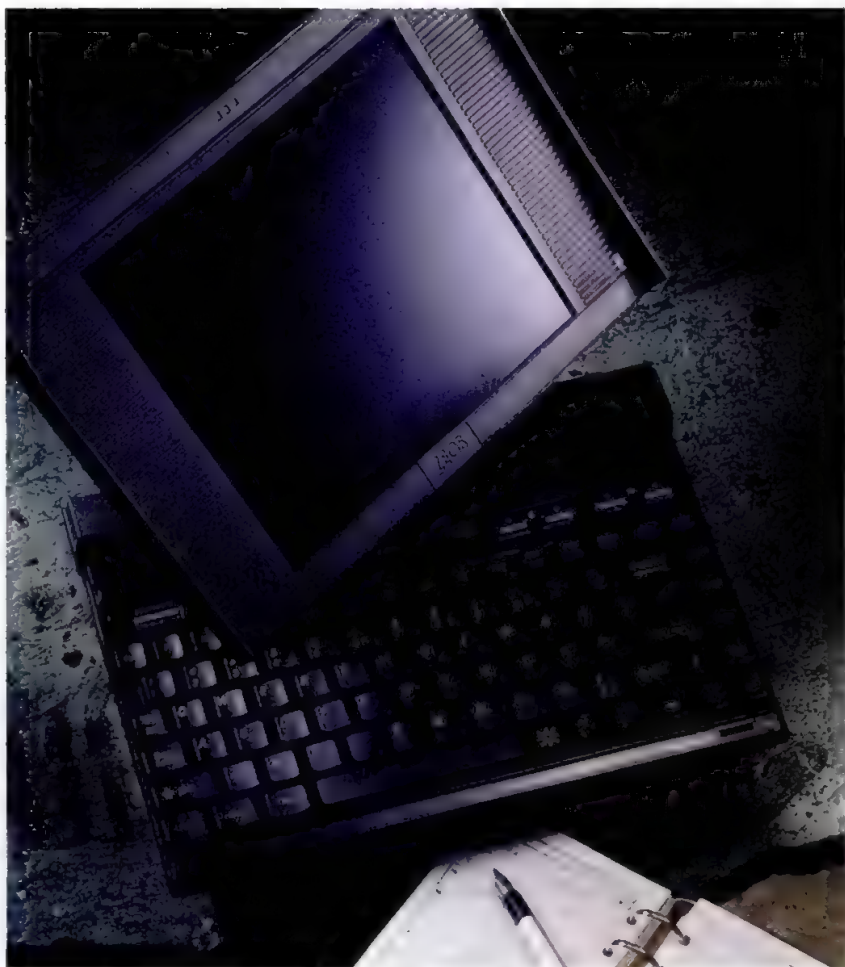
DESIGNED BY USERS. JUST LIKE YOU!

We asked our customers what it is they want in the perfect notebook. The first thing they told us is that most notebooks look like a cigar box with a lid. They told us they wanted not only good looks, but things like great power *and* great battery life. Lightweight too, like five pounds and change. And the keyboard should be effortless to use. The entire product had to be extremely durable. And that was just for starters.

SL POWER. SL BATTERY LIFE. 64K CACHE!

We listened well. Then we got down to work. For the chipset and CPU we selected the Intel 25MHz SL. We then built in a high-speed 64K SRAM cache as standard. We know this system might well replace a desktop for many users.

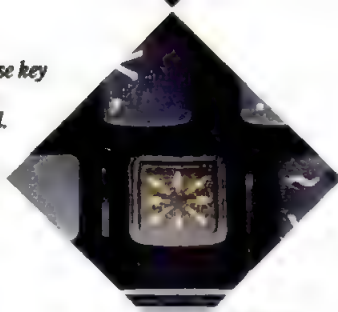
And power to your ZEOS Freestyle/SL system is provided by our advanced battery system. The fully enclosed lightweight battery packs easily snap in and out and can be "quick-charged" when the system is not being used, or trickle-charged when in use. So what happens when the power is on?



GREAT VIDEO TOO.

You get great video! Because for video control, we chose the amazing new Cirrus Logic VGA controller. It not only consumes less power, it also produces the fast crisp images you're looking for. And with a business machine like this you'll also appreciate our dual display capabilities. You can connect an external VGA color monitor for simultaneous display. And that's not all.

Built-in mouse key provides easy cursor control. Leave those bulky mice behind!



This sliding port door won't break off or come loose. Saves your fingers, too.



BUY WITH CONFIDENCE. ZEOS was voted PC Magazine's Readers' Choice for Service & Reliability for both our desktop and notebook systems!

A NOTEBOOK KEYBOARD YOU'RE GOING TO LOVE.

We re-designed and re-sculpted every key from scratch. Even the key-switch mechanism was invented anew. And we added the mouse key for easy cursor control. It is the absolute perfect notebook keyboard. What else?

Lots else! Like the best display system of any notebook available anywhere. We listened here too. The screen is big and easy to read. Plus, it's high contrast and it's fast. It's also very easy to adjust. People said contrast and brightness knobs were hard to use. So we replaced them with soft touch buttons that *electronically* adjust screen settings at your command. Then we really got creative.

THE ONLY NOTEBOOK WITH A TILT & SWIVEL DISPLAY.

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IT FLOATS TOO.

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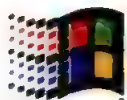
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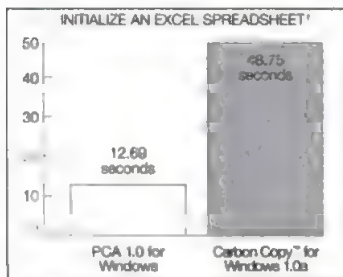
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CIRCLE 186 ON READER SERVICE CARD

Trends

TRENDS & TECHNOLOGY SHAPING THE PERSONAL COMPUTER MARKET



Heard It on the Radio

Personal comm services on the air.

President Clinton's controversial plan for a hard-wired information highway has overshadowed another hot potato called Personal Communications Services (PCS). PCS, loosely defined as a public *wireless* network, is garnering support from a number of compa-

nies. Unlike the information highway, which would link large companies and universities together through high-speed data links, PCS is open to both individuals and companies. If adopted, PCS will make a range of radio frequencies now owned by the government and large utilities available to the public.

Personal Communications Services break down into a number of different components, some free, some fee-based. On the free side is User-PCS (sometimes called *unlicensed PCS*). Like AM/FM radio, as long as you have the proper User-PCS transmitter and receiver, the actual radio frequencies are free. The downside is that it has a very short range (about 50 meters). Wireless LANs, PDAs, PBXs, and telephones will adopt User-PCS.

Carrier-PCS (also known as *licensed PCS*) will provide wide-area access, but it will not be free. It is expected to be controlled by the large wired carriers (AT&T and MCI, for example), which will license the radio fre-

quencies from the federal government and relicense them for a fee. Carrier-PCS is comparable with fee-based paging, radio mail, and wireless LAN services available today.

PCS may sound like another wireless pipe dream, but the 30 or more companies backing it read like a who's who of computerdom. Led by Apple and Hewlett-Packard, companies have banded together to create the Wireless Information Networks Forum (WINForum), which will propose standards to the Federal Communications Commission. WINForum requested 40 MHz of spectrum, but the FCC proposed to allocate only 20 MHz.

If and when PCS will be adopted is anybody's guess. While the U.S. House of Representatives has passed the Emerging Telecommunications Technology Act necessary to make the radio spectrum available, the bill is still stuck in the Senate. But even if the Senate does pass the bill, we won't have PCS phones and LANs before 1995.—*Christopher Barr*

Whole Lotta RAM

TODAY'S APPS WILL SEEM SVELTE compared with products five years from now. New digital data types (video, sound) and new applications (virtual reality) will demand massive amounts of system RAM just to be loaded, and even more to run. Toshiba, Hitachi, and NEC recently presented technical papers describing 256-megabit DRAMs that should be available by the end of the decade.

Each 256-Mb chip is capable of holding 32MB of data—64 times as much data as today's 4-Mb chips. New chip-making processes allow for the higher densities and greater capacities. While Toshiba is using 0.4-submicron technology, Hitachi and NEC are shooting for a 0.25-submicron chip, which would allow more data cells to be written on the silicon wafer. The first 3.1-million-transistor Pentium chip, by comparison, uses 0.8-submicron technology.

—*Christopher Barr*

Move Over, SCSI?

THE GENERAL-PURPOSE INTERFACE bus may be staging a comeback. Also known as the IEEE-488 bus, the GPIB was invented by Hewlett-Packard back when a proprietary connection was the only way to hook up peripherals to your PC. It got lost in the shuffle when other connections came on the scene. But now Capitol Equipment Corp. (CEC) is hoping to revive it.

Although Apple's on-board support for the small computer system interface (SCSI) seemed to sound the death knell for the GPIB, "thousands of scientific instrumentation devices use GPIB to talk to each other," says Sid Mayer, vice president of CEC. The company has figured out a way to boost the interface's raw speed from 1MB to 5MB per second—as fast as SCSI. And the GPIB can support up to 14 devices, compared with SCSI's 7.

But SCSI may already be too well entrenched, says Rod Belshee, marketing manager at Tektronix. "In the PC market, it would take too many people to all agree to go with a new connector."—*Mary Kathleen Flynn*

Pipeline *By Robin Raskin*

Read Any Good Disks?

It's been over a week since I've cracked a book—a printed one, that is. Instead, I've been voraciously reading books on disks in an attempt to answer the question, "Can the disk replace the book?"

I climb into bed and cozy up with my laptop. I sit on airplanes and read by the glow of a backlit display. I preinstall my books before leaving the house and use electronic placeholders to resume reading. One week and five books later, I've



got eyestrain, and a backache from lugging my laptop, and I've developed the nervous habit of scouting for live outlets.

Other than that, how's it going? Well, my first (and probably not the best) choice was *The Last of the Mohicans & The Deerslayer*—a James Fenimore Cooper doubleheader from TurboBooks. (I never cared much for the hard copy, either.)

Instead of reading, I found myself playing literary games, like searching for how many times Chingachook appeared, or leaving myself little notes hidden in Cooper's prose. I followed Cooper with *Den of Thieves* and a sci-fi duo: *Both* were more entertaining. From a price standpoint, the TurboBook series is compelling. The books list for \$19.95 each. They use Microsoft's Windows Viewer technology but include no pictures, sound, or other multimedia. They are lean, though, installing from two floppy disks.

TurboBooks don't hold a candle to the Expanded Books

series from Voyager. These \$19.95 HyperCard derivatives are available only for the Macintosh and include such juicy titles as *Jurassic Park*, *Backlash*, and *The Tao of Pooh*. The margin notes, dog-eared pages, variable type size, pop-up annotations, and footnotes, all of which are disk-based, are considerably more elegant than their PC counterparts.

One book that couldn't be duplicated in paperback comes from *Books That Work*. This clever Windows program, *Designing and Building Your Own Deck*, combines illustrations, animations, text, sound, and a working CAD program. First you learn about deck building and then you design and "cost-out" your own deck.

The winner of my "master the medium" contest goes to Voyager for its \$99.95 CD-ROM series *Who Built America*, a beautifully presented collection of documents, songs, oral histories, images, and videos. The depth of the material is staggering; history comes alive.

There are advantages to electronic books. You can navigate "nonlinearly," search, place bookmarks, create electronic notes, and read in the dark. You can cut and paste (a.k.a. plagiarize?) with ease and, I suppose, you do save a tree. The disadvantages and discomforts are still many. Poor displays, small amounts of text visible at once, and short battery life are just a few.

In the end I suspect electronic books will find their own voice and in the process become very different entities. Content will transform to suit the medium, and we'll read them on crystal-clear displays embedded in PDAs that are no bigger than paperbacks. In the meantime, when it comes time to relax, I'm back to flipping paper pages.

Robin Raskin is an executive editor of PC Magazine.

Next-Generation Bitmap Handling

BY EXPLOITING A TECHNOLOGY almost as old as television, Altamira Software Corp. and Micrografx will be among the first to take the PC a giant step forward when it comes to creating and handling bitmapped images. Both companies are introducing products that will make it easier to edit images.

This new approach treats each bitmap within a composite image as its own object layer. This would let you combine an image of a flock of birds, for example, with an image of a cloudy sky without losing the ability to move the flock. You could also produce a realistic effect of the flock's passing through the clouds. As with vector-based illustration programs, you can stack these layers in any order you'd like, and you can

reorder them as many times as you'd like.

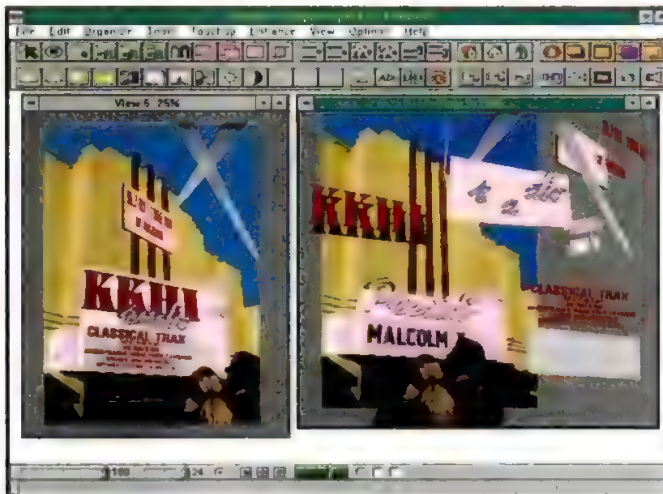
With current raster technology, once you've placed the birds they become part of a single pixel map, and relocating them becomes a tedious process of precisely selecting the area, masking, cutting, pasting, and compositing. Since the flock comes with a built-in mask, it's preselected, and there's no background as there usually would be.

Altamira calls its implementation Dyn-

amic Alpha, and it will initially appear in Altamira's forthcoming image-editing product, *Altamira Composer*. With *Dynamic Alpha*, each object layer has its own alpha channel (a transparency plane, usually referred to by image-editing programs as a *mask*). Each element remains a separate, selectable layer until you choose to "collapse" it into an EPS or TIFF file. Altamira hopes to spawn image libraries (which it calls "crop art") by creating extensions to standard TIFF, JPEG, Targa, and .BMP files, which allow them to support an alpha channel. Altamira also plans to license the technology for use in other bitmap-editing products.

Micrografx, on the other hand, has developed its own layering scheme, which the company will be incorporating into the forthcoming version of its image-editing package, *Picture Publisher*. To conserve memory, Micrografx partitions a single alpha channel and allocates it among the layers, rather than reserving a separate channel for each layer.

—Lori Grunin



Altamira Composer gives you more flexibility in editing images.

Mainstream RAID

PC USERS ARE BEGINNING TO GET the fault-tolerance capabilities their mini- and mainframe-using colleagues already enjoy. You can already buy hardware RAID solutions for the PC environment; Compu-Add, for example, recently brought out an inexpensive line of DriveArray products ranging from \$7,500 to \$16,000. And *PC Magazine* will be evaluating external RAID subsystems in an upcoming issue. There are also software packages that come bundled with hardware, such as Micropolis's RAID-ion and Chantal Systems' Paragon. Now both Corel and Microsoft are beginning to deliver RAID software solutions that support a wide variety of off-the-shelf disks.

RAID (Redundant Array of Inexpensive Disks) allows multiple hard disks to appear as a single volume, making it a cheaper storage solution than a single large expensive disk. Because RAID can allow simultaneous reads and writes (depending on the level), it is also faster than a single large expensive disk.

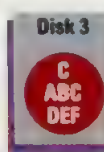
There are six levels of RAID: The most basic is Level 0, which stripes data across multiple drives but doesn't provide any parity. (Strictly speaking, Level 0 isn't RAID, because it lacks parity.) Level 1 is the most expensive, because it uses disk mirroring (two identical hard disks) and duplexing (two controllers). Level 2 spreads bits of each block of data across multiple drives (a technique known as *bit interleaving*) and requires that several drives be dedicated to parity. Level 3 spreads bytes across drives (*byte interleaving*) and needs only one parity drive. Level 4 uses block interleaving and one parity drive. And Level 5 uses block interleaving and spreads the parity information across multiple drives—letting the system do simultaneous reads as well as writes, therefore making it the best performance/protection combination.

Like CorelSCSI, Corel's new CorelRAID works with just about any SCSI hard disk (as long as it supports the ASPI interface language). Priced at \$995, CorelRAID is expected to enable RAID solutions that would cost you roughly one-tenth as much as the hardware/software bundles already on the market. CorelRAID supports Levels 4 and 5 and works with NetWare 3.11. Drivers for NetWare 4.0, Windows NT, and Unix are planned.

Windows NT will also have native support for RAID built in. The base-level product will include Level 0 support, and the

Fault Tolerance: RAID Level 5

File server



RAID Level 5 uses block interleaving and spreads the parity information across multiple hard disks.

Advanced Server will include Level 5 support. It's not clear yet whether there will be an opportunity for third-party products to add value to NT's RAID. With Corel and Microsoft in the market, desktop PC users will have access to all the advantages of RAID.

—Mary Kathleen Flynn

Top Retail Software

Current ranking	Last issue	Product	Company
1	—	MS-DOS 6.0 Upgrade Kit	Microsoft Corp.
2	4	Microsoft Windows 3.1	Microsoft Corp.
3	—	Lotus Improv for Windows 2.0	Lotus Development Corp.
4	7	QEMM-386 6.0	Quarterdeck Office Systems
5	—	PC Tools for Windows	Central Point Software Inc.
6	5	Stacker 3.0	Stac Electronics
7	—	Paradox for Windows	Borland International Inc.
8	—	Microsoft Windows 3.1 Upgrade Kit	Microsoft Corp.
9	—	Microsoft Visual C++ for Windows	Microsoft Corp.
10	—	Quattro Pro for Windows	Borland International Inc.
11	12	Microsoft Office for Windows 3.0	Microsoft Corp.
12	8	WordPerfect 5.2 for Windows	WordPerfect Corp.
13	10	WordPerfect 5.2 for Windows Upgrade Kit	WordPerfect Corp.
14	—	Microsoft Excel 4.0 Upgrade Kit	Microsoft Corp.
15	—	FaceLift for WordPerfect 2.0	BiStream Inc.

This list ranks PC business programs according to the total number of copies shipped to stores and resellers in the week ending March 27, 1993. The list is based on shipments to more than 12,000 retail locations. It does not include sales made directly by software publishers and cannot be interpreted as a picture of the entire software market. Sales information compiled by Ingram-Micro.

Saving Power

INTEL'S ABOUT-FACE ON THE 486SL may have been aided by the wave of power-saving core logic chips pouring in from Silicon Valley. Startup PicoPower Technology and chip set maker OPTi have developed support chips that help any 486 save more power than the 486SL could alone.

The 486SL, with integrated controllers and power-saving features, was Intel's solution for system designers who wanted everything rolled into one chip. But after shipping only 20- and 25-MHz versions, with a 33 in the oven, Intel has decided to go with a new S-series. While Intel has yet to disclose actual product plans, sources say the S-series won't have the SL's bus and memory controllers, but will be static and will have System Management Mode (SMM) built in.

SMM allows notebook makers to use "passive power management, which works when the computer is not being used, like in sleep or doze mode," says Carolyn Rogers, director of strategic marketing at PicoPower. PicoPower's Evergreen HV core logic chip provides "active power management and saves power while you are actually using it." Rogers claims Evergreen HV can make batteries last up to 6 hours.

OPTi's chip uses its proprietary Sequencer technology to perform the power-saving magic. Operating from an EPROM, the Sequencer can execute the power-management microcode without the intervention of the CPU. Both companies have 3-volt, 5-volt, and mixed-voltage versions that work with most 486 chips and with the most popular BIOSes.

While OPTi and PicoPower offer their power-miser chips to third parties like Dell, some computer makers with chip capabilities, such as Texas Instruments (TI) and IBM, are making their own support chips. TI, for example, uses a proprietary power-saving chip in its TravelMate 4000 WinDX2/50, which allowed it to run for more than 5 hours on our ZDigit Rundown test.

—Christopher Barr

Briefs

PROMPTED BY CONCERNS THAT ELECTRONIC

devices may interfere with in-flight navigation and communications systems, some airlines are restricting the use of laptops and other devices. Most carriers allow laptops during the flight but not during take-off or landing. But Northwest Airlines recently banned them at heights below 10,000 feet. And the RTCA, a federal advisory committee that previously concluded the possibility of interference was "remote," is reexamining the issue.

SIXTY-EIGHT PERCENT OF THE 1,100 UNI-

Forum attendees who participated in Dun & Bradstreet Software's survey believe Vice President Al Gore's project to implement a coast-to-coast electronic information highway by 2015 is realistic.

ADOBE SYSTEMS IS MAKING THE STANDARD

Generalized Markup Language a key

component of its desktop publishing tools strategy (Trends, April 13, 1993). The company has signed on Avalanche Development to map SGML to Adobe's Acrobat, which lets you view a document on virtually any platform.

ACER AMERICA CORP. HAS DEVELOPED A

chip set that should make it easier for PC manufacturers to build systems based on MIPS Technologies' R4000 64-bit RISC chips (Trends, April 27, 1993). Machines based on Acer's chip set should cost end users approximately \$3,500.

YOU CAN ORDER THOUSANDS OF TRAVEL

maps, guides, and brochures through a new on-line service called Worldwide Brochures (BBS: 218-847-3027). The annual membership fee is \$12, but the information is free, and there are no on-line charges.—Mary Kathleen Flynn

Smooth as Glass

IN 1988, AREAL TECHNOLOGY came out with a revolutionary new design for hard disks: While most hard disk platters are made of aluminum, the platter on Areal's disk was made of glass. It has taken five years, but this technology—along with its ability to increase storage capacity and reduce the physical size of drives—is beginning to pay off, as several hard disk manufacturers will come out with glass-based drives this year.

Glass platters offer a number of advantages over aluminum platters. Because they are smoother than aluminum, glass allows the head to fly closer to the platter. This increases the areal density, meaning that more data can fit onto the disk. Glass is more stable than aluminum and thus more resistant to shock from being dropped or damaged from coming into contact with the

head. And because glass is very stiff, the platters can be made thinner, which helps to reduce the physical height of the entire drive.

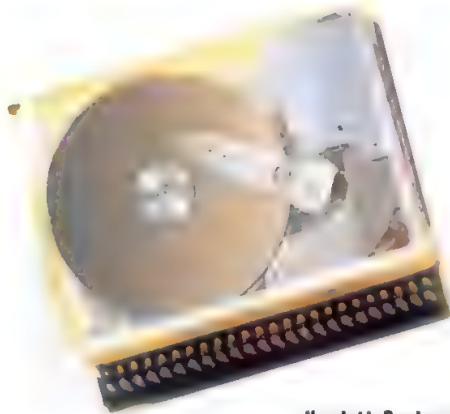
Perhaps the only disadvantage is that glass platters are more expensive to produce. The costs will come down as demand for the platters increases.

Every hard disk Areal offers is made with glass platters, including its \$525 A260, a 2.5-inch 260MB drive with a physical height

of 15 mm (408-436-6800). Major players in the storage market are quickly joining Areal in the move to glass platters. Toshiba offers the \$725 MK-2224FC, a 2.5-inch 213MB drive, 19 mm high (714-583-3111). Other glass-based drives expected later this year are the \$499 HP Kittyhawk II PSM from Hew-

lett-Packard, a 1.3-inch 42.8MB drive, 10.5 mm high (800-826-4111); and the \$499 Maxtor MXL-105-III, a 1.8-inch 105MB drive on a PCMCIA Type III card (408-432-1700).

—Daniel A. Begun



Hewlett-Packard's new 1.3-inch Kittyhawk II PSM hard disk uses glass.

DMTF: Common Enemy Is Chaos

WHEN COMPETITORS JOIN FORCES to solve a problem in the PC industry, they often gang up on a common enemy. In the past, IBM was the usual suspect. Today, Microsoft is the inevitable target. But at least one new multivendor alliance, the Desktop Management Task Force (DMTF), seems determined to include everybody—even IBM and Microsoft.

The DMTF was founded last year by Digital Equipment Corp., Hewlett-Packard, IBM, Intel, Microsoft, Novell, SunConnect, and SynOptics Communications. The group is trying to establish an API architecture called the Desktop Management Interface (DMI). The DMI is designed to let users easily access and manage all the components hooked up to a desktop computer (applications, add-in boards, peripherals, and so on). Working with standalone and networked PCs, the DMI spec is independent of hardware platforms and operating systems; the Apple Macintosh, DOS, NetWare, OS/2, Unix, Windows, and Windows NT are all supported. And instead of relying on the Simple Network Management Protocol (SNMP), the DMI is protocol-independent.

Instead of duplicating the efforts of other groups, the DMTF seems eager to work with them. It has already teamed up with the Distributed Support Information Standard (DSIS) group, which includes Bell Atlantic Business Systems Services, Digital, HAL Computer Systems, HP, ICL PCL, Microsoft, Olivetti, and Sun Microsystems. DSIS is creating object definitions to populate a management information base (MIB) for distributed computing environments. The DMTF is also exploring ways to work with Intel and Microsoft's Plug and Play strategy for adapter cards (Trends, May 11, 1993). And the DMTF hopes to work with the Common Open Software Environment (COSE) group (HP, IBM, The Santa Cruz Operation, SunSoft, Univel, and Unix System Laboratories), which is trying to develop a standard version of Unix.

Creating a desktop management architecture everyone can live with is certainly an ambitious project. But with 150 participating companies already reviewing the spec, the DMTF may well pull it off.

—Mary Kathleen Flynn

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THE INTELLIGENCE OF THE 386SL CHIP

Intel designed the 386SL processor specifically for notebooks. And they were right on target! You'll find that this sharp processor extends your battery life significantly because it's intelligent enough to power-down the memory, disks, modem, and more when they're not in use. It's perfect for the stop-and-go computing that you're likely to do every day.

MANAGE YOUR POWER.

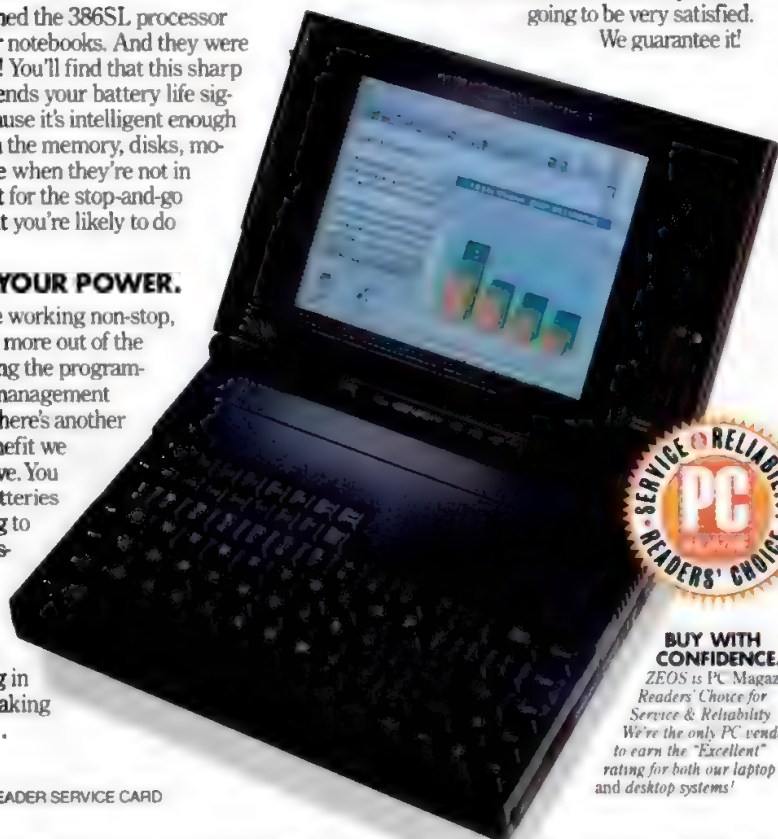
Or if you're working non-stop, you'll get even more out of the battery by using the program-mable power management features. And here's another really neat benefit we know you'll love. You can change batteries without having to shut off the system! You can even use Suspend/Resume when you're working in Windows. Speaking of Windows...

FREE LOTUS SOFTWARE.

We don't just stop with great hardware. In packages 2 and 3 we're giving you—absolutely free—your choice of either Lotus 1-2-3, Ami Pro or Freelance Graphics. And that's in addition to DOS, Windows, and the new Lotus Organizer—the personal information manager highly recommended by *PC Magazine*. With all the free software you get from ZEOS, you save hundreds of dollars!

WE'RE HERE FOR YOU 24 HOURS A DAY.

Buying from ZEOS means you also receive our award-winning after-the-sale support and service: 24-Hour-a-Day Toll-Free Technical Support, 365 days a year. You also receive our 30-Day Absolute Satisfaction Money-Back Guarantee and One Year Limited Warranty. You're going to be very satisfied. We guarantee it!



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Landmark Speed 2.0:	16 MHz	84 MHz	84 MHz
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ATMaster	PS/2 Model 40	With ATM SX 25	PS/2 Model 90048/SX 25
Landmark Speed 2.0:	21 MHz	84 MHz	84 MHz
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All systems tested with 16MB installed except ATMaster, tested with 640K, and MCMaster, tested with 640K on-board and 640K on mother board. All system prices are MSRP at standard configuration as of 2/1/91. Processor upgrade prices are MSRP as of 3/1/91. Recount conducted on 3MB Excel for Windows spreadsheet generated by Kingston Technology.

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First Looks

HANDS-ON EVALUATIONS OF THE NEWEST SHIPPING PRODUCTS

Windows Utilities

PC Tools Builds the Most Flexible Windows Desktop

BY EDWARD MENDELSON

With PC Tools for Windows, Central Point Software got it right the first time. This \$179.95 package includes a Microsoft Windows desktop that is vastly more flexible and customizable than Windows' built-in Program Manager, but similar enough to Windows' native design so you can use it without spending a month in retraining.

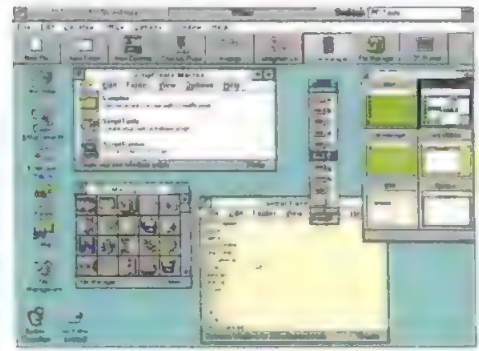
The software also includes a suite of uniquely powerful Windows-based disk-maintenance and file-management utilities, a batch language that combines effortless macro recording with an effective programming function, Central Point's well-

established backup and antivirus programs, and miscellaneous utilities including system information, screen savers, and an icon editor.

PC Tools' drag-and-drop desktop can be as elaborate or as Spartan as you choose. It lets you remove its optional toolbar, title bar, and even its top-line menu for a completely clean

screen. The second mouse button always brings up a quick menu of relevant options for the icon, menu, window, or desktop under the cursor.

On installation, the package creates a set of multiple desktops, each with a different set of



VARIETY: PC Tools has many display formats.

applications and files and a different wallpaper. You jump from one desktop to another via *Continues on 38*

A Mac Classic Comes to Windows Photoshop Ushers In a New Era in PC Image Editing

BY LUISA SIMONE

Adobe Photoshop for Windows is an indispensable tool for professional image-makers—with the emphasis on professional. While this \$895 image-editing program addresses the needs of a wide range of users—including illustrators, photographers, video artists, retouchers, and prepress technicians—it is not intended for casual or business users. That said, there is little left to do but heap praise upon this near-perfect Windows version of a Mac-based classic.

The cornerstone of any image-editing program is its approach to mundane jobs such as cleaning up bad scans or improving the print quality of an image. Photoshop's tools are production-oriented and extremely powerful. For example, the Levels dialog box mimics a traditional prepress shop, letting

you set the highlight and shadow areas of a picture.

If you're working with non-

wheel metaphor, where you choose among six hue shifts and two brightness levels, makes short work of adjusting the overall values in a picture.

Purists, however, will rely upon traditional filters, such as Brightness and Contrast, Equalization, or Hue and Saturation



SPECIAL EFFECTS: Photoshop turns a plain photo into a work of art.

critical images, you can use the new Variations feature to point and shoot your way to balanced, brighter pictures. The color-

to fine-tune their images. You can use any of these tonal adjustments regardless of whether you

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First Looks

PC Tools

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hotkeys or by clicking on a miniature map of all your desktops, and any window can be made to tag along when you move. Applications that you leave open when you exit Windows reopen automatically in the same place when you start up again.

One or more desktops can be organized into groups called offices, and one or more offices can be open at once. Unlike the "virtual desktop" of hDC Power Launcher, only one desktop is active at a time. You can't use Alt-Tab to move among programs on different desktops, and you can't have half of one desktop and half of another on-screen at once.

PC Tools lets you place program and file icons anywhere on any desktop—as on the single desktop of The Norton Desktop for Windows—or store icons into groups like those in Program Manager. Groups can be displayed in the familiar icon format, or as toolboxes without captions, lists with icons and descriptive texts, or compact lists with nothing but the names displayed.

Each group can have different icon spacing, background colors, password protection, and a dozen other options. The desktop and all other utilities in the package have customizable toolbars and menus. No other package lets you make adjustments in such fine detail or waste so much time making everything on screen suit your taste—or use up so much memory and resources on multiple desktops and open applications. Fortunately, desktops can be temporarily closed to recover memory when needed.

The desktop loads and operates more quickly than Norton's, and its only serious flaws are its inconsistencies. If you keep two Excel spreadsheets in two desktops, the program is smart enough to open only one copy of Excel for both, but it isn't smart enough to make Excel switch between the spreadsheets when you switch between the desktops. It automatically reopens an application when you restart Windows only if you first opened the application from a desktop icon or group, not if you opened it from the program's file manager or Run box. At least one program, Ares Software's FontMinder, closes with an error when PC Tools opens it automatically.

CUSTOMIZABLE TOOLBARS

The customizable toolbars and menus can include any program, file, or command—including batch commands written or recorded in the package's script language. But each utility in the package has its own set of built-in tools, which it can't share. The file manager, for example, includes a tool that opens a DOS window with a mouse click, but if you want a similar tool on the desktop's toolbar, you'll have to create it yourself.

Unlike The Norton Desktop (recently upgraded to Version 2.2 with enhanced network and DOS 6 support), PC Tools keeps file and program management in separate applications. PC Tools' file manager is familiar enough to use right out of the box, since it looks and acts like a souped-up version of the Windows File Manager. It includes fast file viewers that display the fonts in your documents and even calculate automatic paragraph numbering.

PC Tools' viewers choke on some files that Norton handles easily, but Norton fails with

some that PC Tools understands. The program comes with 20 applets that perform standard file-management functions without opening the file manager itself.

FACT FILE

PC Tools for Windows, Version 1.0

Central Point Software Inc.,
15220 NW Greenbrier Pkwy.,
Beaverton, OR 97006;
800-445-4208, 503-690-8090;
fax, 503-690-8083

List price: \$179.95, upgrade, \$49.95.

Requires: 4MB RAM, 3-14MB hard disk space, Windows 3.1 in Enhanced mode.

In short: PC Tools for Windows features countless disk and file utilities and a sensible desktop replacement that lets you customize the way you work in Windows

424 ON READER SERVICE CARD

The file manager compresses files in PKZIP 1.x format and displays files in most other compressed formats. Like Norton and the file manager in WordPerfect for Windows, PC Tools jumps to a filename when you type enough letters to identify the name uniquely.

DISK UTILITIES

PC Tools' DiskFix program has the unique ability to perform low-level repairs without making you exit to DOS, and the defragmenter works in the background while you run other programs.

This process is terrifying to watch, because background defragmenting can be lethal to your disk if Windows loses track of the changes to the disk's structure. The defragmenter lurches to a safe stop whenever Windows accesses any disk in your system. You have to return to the menu to start the defragger up again, although it can be set

to start automatically after a specified idle time.

If you've been frustrated by Windows' macro recorders and batch languages, you'll be delighted with PC Tools' ScriptTools, which avoids virtually all of the limits and inconveniences of rival packages. It isn't as fast as a programming language, but it offers an easier route to advanced batch files than anything else. Central Point won't say who wrote ScriptTools, but it bears an uncanny resemblance to Automator for Windows by Direct Technology.

Rounding out the package are a system consultant that reports on your system and suggests improvements, a utility that creates an emergency disk, an undelete tool, an icon editor, antivirus software, and a scheduler that lets you cancel an event or press a snooze button to postpone it. Also included is Central Point's popular backup program, with strong tape and network support.

Unlike Norton, PC Tools doesn't offer desktop utilities such as calculators or icons for multiple printers, but it includes the most useful and extensive



BACKGROUND DEFRAG: PC Tools optimizes disks while you run other programs.

desktop, disk, and file utilities available in any Windows package. Like all desktop replacements, it may be larger and more complex than you need, but if you're looking for a desktop that is superior to the one that comes with Windows, PC Tools is powerful and flexible enough to let you create exactly the desktop you want. □

FIRST LOOKS PLUS

To download a working demo of PC Tools for Windows from PC MagNet, type GO ZNT-EXEC from any CompuServe prompt. From May 17 through May 21, you can go online to discuss PC Tools for Windows with Edward Mendelson and PC Tools product managers. Type GO ZNT-EXEC.

First Looks

Photoshop

CONTINUED FROM PAGE 37

are working in gray-scale, RGB, CYMK, duotone, or LAB color models. This fact is especially important for truly high-end users who can scan and modify 32-bit CYMK images using Photoshop without any loss of

including a choice between Type 1 and TrueType fonts, sizes between 4 and 360 points, leading, letter spacing, and alignment controls.

Photoshop's complement of filters includes a host of special effects, including Ripple, Twirl, Lens Flare, and Solarize. These filters—as well as the ability to rotate and skew a picture—are

totally free-form selection area, you can use the stylus tool to draw a shape (or path) with Bezier curves and then convert it to a selection area. Likewise, if you want to apply an effect with varying intensity levels, use the new Quick Mask feature to convert the current selection into an editable 8-bit mask.

Managing numerous masks and Bezier curve objects is easier than ever with two new palettes: Channels and Paths. Channels gives you quick access to up to 16 different channels, where each channel can store a color component (RGB data requires 3 channels, CYMK data requires 4) or an 8-bit mask.

BINARY COMPATIBILITY

Photoshop emulates its Mac predecessor in many positive ways. On a basic level, the files are binary compatible across platforms—a boon to anyone sending files to Mac-centric service bureaus. Photoshop also creates a powerful synergy with Adobe Illustrator by rasterizing vector-based EPS images on the fly.

Our testing did reveal one instance in which mimicking the Mac is less than ideal. Several of the Distort filters are so computationally intensive that Photo-

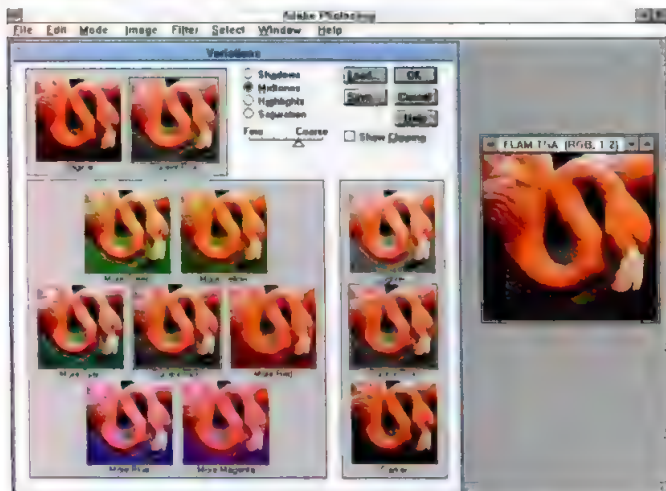
shop must keep the image wholly in RAM while it renders the effect. The result was an error message reporting insufficient RAM, even with 16MB.

In all other respects, performance is admirable. Provided you are using a fast machine (our test system was a 66-MHz 486), you'll find that Photoshop can keep pace with its fastest competitor, Aldus PhotoStyler. And if you're a speed demon, you'll be thrilled by the hardware enhancements that can turbocharge Photoshop. Not only is Photoshop optimized for the Pentium chip, but Version 2.5 boasts an open architecture that will allow the new breed of DSP (Digital Signal Processor) boards to speed up operations.

Photoshop can accommodate almost any production environment. Robust import and export options support many raster file types, notably .BMP, .PCX, Pixar, Scitex, Targa, TIFF, and EPS JPEG. It can also acquire scanned images directly (via Adobe Plug-in support for the Twain scanning interface) and generate four-color separations complete with dot gain compensation and undercolor removal.

No review would be complete without a short wish list: Ours includes previews for special-effect filters, drag-and-drop printing, OLE support, and a file browser that can search on key words. A number of third-party plug-ins have already been announced, including filters from Kai's Power Tools, support for specialized scanners such as the BarneyScan PixelCraft, and calibration routines from Savitor.

Assuming that your choice of an image-editing program is Adobe Photoshop or nothing would be a mistake. Alternatives, such as Micrografx Picture Publisher, ZSoft's FotoFinish, or Caere's Image Assistant, offer gentler learning curves and dramatically lower prices. But if you want your PC-based electronic studio to be as powerful as the best the Mac has to offer, Photoshop is a must-have program. □



VARIATIONS BOX: You get point-and-shoot image editing.

information. The bonus is that the conversion between modes is instantaneous; other image editing programs require you to go through a laborious translation process.

If you want to do something more than fiddle with histograms and gamma curves, you can turn to Photoshop's artistic brushes and retouching tools. The ability to determine the size, opacity, and level of antialiasing for each and every tool means that you have total control. Though not primarily a paint program, Photoshop does boast some artsy features, such as the ability to mix new colors or to simulate a brush stroke thinning as it runs out of paint. Photoshop's brushes will respond to a pressure-sensitive stylus, but only if your digitizing tablet is 100 percent compatible with Windows for Pen Computing.

The toolbox also contains text functions. Though you can't edit text on screen, the text dialog box does give you a wide range of formatting options,

enhanced exponentially by Photoshop's sophisticated selection functions. Simply reporting that Photoshop offers rectangular, elliptical, lasso, and magicwand selection tools is to misrepresent their real power. For example, anyone who has ever struggled to get the right similarity threshold setting for a magicwand tool will love Photoshop's improvements. Simply hold down the Shift key and click again to have Photoshop add a new set of similar colors to the current selection area. Better yet, use the Grow and Similar commands to increase the selection area or to choose noncontiguous color patches.

Unlike most other Windows-based image editors, Photoshop makes a clear distinction between selection areas, masks, and paths. And again, unlike other programs, Photoshop allows you to convert one to the other easily, so selection areas can become masks and paths can become selection areas.

If you need a precise yet

FACT FILE

Adobe Photoshop for Windows, Version 2.5

Adobe Systems Inc., 1585 Charleston Rd., Mountain View, CA 94039; 800-833-6687, 415-961-4400

List price: \$895

Requires: 4MB RAM, DOS 5.0, Windows 3.1; 486-based PC, 8MB RAM, 24-bit adapter recommended

In short: Adobe Photoshop for Windows redefines the high end of the image editing market. Whether you are looking for production-oriented enhancement tools, artistic special effects, or responsive brushes, look no further than this Mac—and now Windows—classic.

ON READER SERVICE CARD

■ Spreadsheet Add-Ins

Slice and Pivot Data with Perspectives

BY CRAIG STINSON

Sinper Corp. insists that TM/1 Perspectives is a "database for spreadsheet users," not a multi-dimensional modeling tool like Lotus Improv. But like its better-known competitor, Perspectives is a product that enables you to slice, dice, pivot, and analyze tabular data that has too many categories to fit in a traditional row-by-column-by-page format.

Unlike Improv, however, the \$495 Perspectives is a client-server product that puts a spreadsheet-style window onto disk-based table files. The tables may include up to eight "dimensions" (for example, sales by region by year by channel by budget by actuals, and so on) and may either be created directly from within Perspectives or imported from comma-delimited sources. Its modeling features are few, but it's designed to work with large corporate data resources and is well suited for multiuser environments.

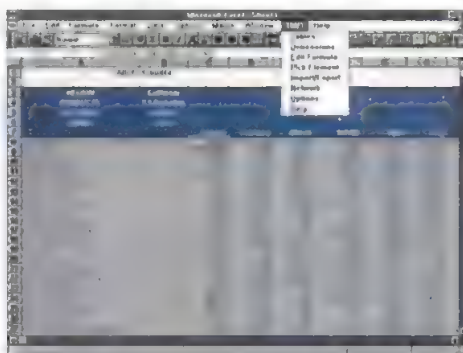
Perspectives is implemented as an add-in for either Microsoft Excel 4.0 or Lotus Development Corp.'s 1-2-3 for Windows 1.1. (The two versions are shipped together and share a common table-file format.) In a typical scenario, you use the add-in to browse a data table, then bring any two-dimensional "slice" of the data into the host spreadsheet for analysis and presentation.

In its browsing mode, Perspective's simple menu selections let you swap dimensions in and out of the rows and columns so you can see the table in varying perspectives. Once sliced and sent to the host spreadsheet, the data is linked by custom external lookup functions to the underlying table.

The facilities for building calculated values into the data table

are, unfortunately, rather anemic. Elements within dimensions may sum other elements—for example, an element named Southwest could be made to add the values in elements named Arizona, California, and Nevada—but deriving average values is cumbersome, and other forms of aggregation are simply unavailable. You can do all such calculations within the host spreadsheet, of course, but you'll long for a little more intelligence at the table end.

Perspectives is derived from



SWAP IN: Analyze eight categories of data.

a DOS-based program called TM/1, now in Version 4.0, and Perspectives improves on TM/1 by having an interface that is

nearly self-explanatory.

Spreadsheet users who need to build complex multidimensional models from scratch will find more to like in Improv. If

you want to use Excel or 1-2-3 for Windows as a tool for analyzing voluminous external data, however, you should give TM/1 Perspectives a look.

• List price: *TM/1 Perspectives, Version 1.0, Professional Version*, \$495; *Corporate Version*, \$795. Requires: 4MB RAM, Microsoft Windows 3.1, Excel 4.0 or 1-2-3 for Windows 1.1 or later. Sinper Corp., 31

Mountain Blvd., Warren, NJ 07059; 800-822-1596, 908-795-9880; fax, 908-755-9230.

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■ Ink Jet Printers

Epson Stylus 800: Sharp, Dark Text for \$449

BY CATHERINE KUNKEMUELLER

Epson's new \$449 Stylus 800 ink jet printer produces laserlike 360-by-360-dpi output at a competitive ink jet price. Its text output, in particular, is surprisingly dark and crisp.

One of the secrets of the Stylus 800's success is Epson's patented MultiLayer Actuator Head (MACH). MACH technology uses a high-pressure, quick response ink cavity, which the company claims makes the ink droplets uniformly spherical, eliminating the misting found with many other ink jets.

MACH technology also uses a refillable ink cartridge separate from the 48-nozzle ink head. This approach differs from the combined printhead/ink cartridge unit found on most ink jet printers. Although replacing the printhead each time the ink runs out helps to bypass historical ink jet problems such as clogged printheads or messy ink refills, it can also add to the cost.

The printer has a 30-second cleaning cycle that lets you pump

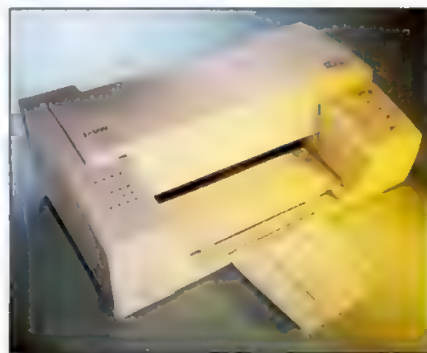
more ink into the printhead if the print quality starts to drop. A \$19.99 ink cartridge refill is rated for 700,000 characters in letter-quality mode.

Assuming 2,000 characters per double-spaced page of text, this works out to a per-page cost of just under 6 cents, much lower than the 9- to 10-cents-per-page cost of a typical ink jet printer. An economy mode reduces the amount of ink sprayed on the paper by 50 percent, extending the life of a cartridge and producing slightly lighter output without significantly affecting speed.

The Stylus 800 completed our Standard Text Speed test with a score of 71 characters per second in letter-quality mode. Though speedy, it's still not in the class of the phenomenal 200 cps of the more expensive Canon BJ-300 or BJ-330, however. The printer produced 1.8 graphics pages per minute, another good score, but graphics quality was much poorer

than the text quality: Black areas were just not dark, and grays were prone to banding.

The Stylus 800 competes well with the \$479 HP DeskJet and the \$449 Canon BJ-200. Even though it's getting easier and easier to find a decent laser



SIX CENTS A PAGE: For laserlike output.

printer under \$1,000, there's still plenty of room for this kind of improved ink jet technology.

• List price: *Epson Stylus 800*, \$449. Requires: *Parallel port and cable*. Epson America Inc., 20770 Madrona Ave., Torrance, CA 90503; 800-289-3776, 310-782-0770; fax, 310-782-4235.

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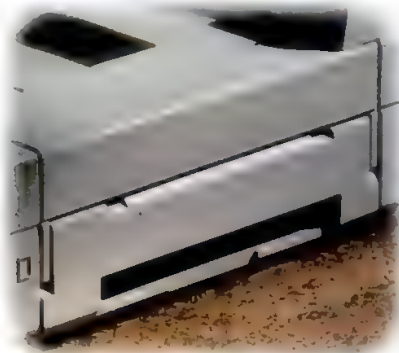
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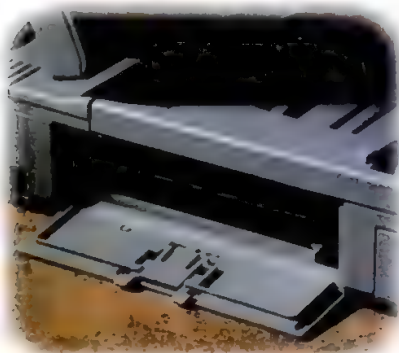
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■ Accounting Software

Great Plains Dynamics: High-End GUI Accounting

BY SALLY WEST AND
TOM WHITE

Great Plains Dynamics, the new graphical high-end accounting system from Great Plains Software, does an excellent job of bringing together Macintosh and Microsoft Windows systems. It allows simultaneous access by both types of users and provides identical interfaces on both sides.

Great Plains used Dexterity, its own object-oriented development environment, to develop Dynamics. Applications created with Dexterity are immediately ready to run on both Windows-based PCs and Macintoshes. Windows systems can use either FairCom Corp.'s c-tree or Novell's Btrieve file manager, but Macs must use c-tree because Btrieve is not supported—a disappointment, given the availability of Btrieve-based add-ons like tools such as Channel Computing's Forest & Trees.

Interoperability is only part of the story, though. Equally interesting is how Dynamics' graphical interface changes the way accounting software is used. Dynamics modules (priced from \$500 to \$1,500) include General Ledger, System Manager with Report Writer, and Dynamics Modifier. Great Plains plans to release more than 20 other modules throughout the year.

FLEXIBLE SCREEN DESIGNER

Dynamics provides excellent tools for customizing an accounting system to meet a company's specific needs. With Dynamics Modifier (\$1,000), you can globally change field names or menu options, or you can customize the layout of any data entry screen for a particular user. Using a WYSIWYG screen

designer, you can easily move, add, or hide fields on the screen. By changing fonts, importing graphics, and adding color, you can create entry screens that resemble existing forms. These customizations don't affect your ability to upgrade.

Dynamics Report Writer illustrates the benefits that a GUI interface can have in terms of report writing. To create a report layout, you drag fields from the field list to a WYSIWYG report image. You can easily change the fonts, size, and styles, and even import graphics. You can modify the standard reports that come with the system or create new reports from scratch. Dynamics Report Writer lacks the sophistication to print complex reports because it cannot summarize data prior to printing, but it is otherwise an excellent tool for simple accounting reports.

Unfortunately, Dynamics lets only one user at a time use the Report Writer, and it doesn't allow users to print custom reports while anyone is in the Report Writer.

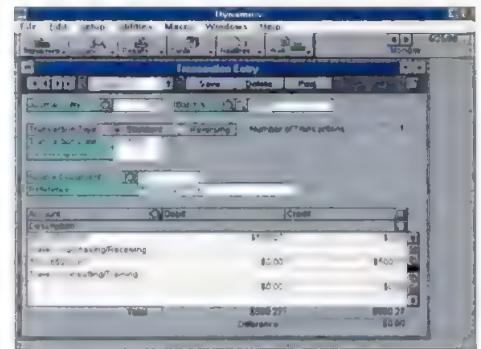
All of the program's screens are well-designed and should appeal to avid Windows and Mac users. Command buttons, drop-down boxes, and scroll bars are plentiful, and the help function is quite robust. The main menu's task orientation may take some getting used to. For example, to print a trial balance report, you select Reports first and then General Ledger; most other systems reverse the order. But the data-entry screens are very intuitive. A welcome enhancement for users doing "heads-down" data entry would be a keystroke option for each button, which would eliminate the need for a mouse.

PRODUCTIVITY TOOLS

Dynamics provides several handy tools that make your job easier. The background-processing option will run lengthy processes (reports and postings) in the background while you continue to work. The Routines option lets you set up a To Do list of tasks to be completed on a regular basis. Tasks can be Dynamics or non-Dynamics functions. When the task is completed, Dynamics will stamp it with the completion date and your user ID. Similarly, you can set up a special menu that includes tasks you wish a particular user to execute, which is handy for

new or temporary employees. Finally, macros let you automate standard functions.

The basic General Ledger module supports the needs of companies with basic financial accounting needs. It offers only two budgets, one year of General Ledger history, and simplistic financial reports. The Advanced Financial Analysis module, due out later this year, will provide for unlimited years of history, an unlimited number of budgets, and a powerful financial report writer. The Conso-



ADD IT UP: General Ledger transactions can be entered by batch or posted immediately.

olidation module, which will have consolidated reporting of multiple companies, and the Multi-Currency Management module are also expected by year's end.

General Ledger account structures can be up to 20 characters in length, with up to five user-defined segments. The segments track such things as divisions, departments, and locations. The system handles both financial (posting) and statistical accounts. It allows for both fixed and variable allocations and can use the value in a statistical account as the basis for the allocation (such as allocating rent by square feet).

Though only a handful of the modules is available, it's easy to see why Dynamics' future looks so bright. With its powerful development language, excellent customization tools, and easy-to-use report writer, this graphical accounting product is worthy of consideration for Microsoft Windows, Macintosh, and mixed environments. □

FACT FILE

Great Plains Dynamics, Version 1.0

Great Plains Software, 1701 SW 38th St., Fargo, ND 58103; 800-456-0025, 701-281-0550; fax, 701-282-4826

List price: System Manager with Report Writer, \$1,500. General Ledger, \$500. Dynamics Modifier, \$1,000.

Requires: 4MB RAM, 25MB hard disk space, Microsoft Windows 3.1.

In short: A high-end accounting package with a bright future, Great Plains Dynamics unites multiple-platform environments running both Microsoft Windows-based PCs and Macintoshes. The three initial components will be followed by a complete line of accounting modules.

42 ON READER SERVICE CARD

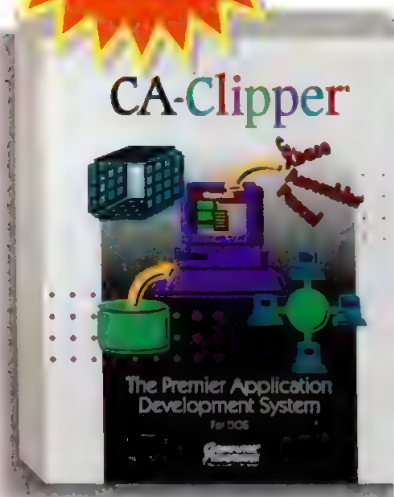
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Feature	CA-Clipper	FoxPro	dBASE IV
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User defined commands	YES	NO	NO
Code Blocks	YES	NO	NO
Nested Multidimensional Arrays	YES	NO	NO
Prefdefined Object Classes	YES	NO	NO
Variables Modifiable in Debugger	YES	NO	NO
Customizable Reactive Error Handling	YES	NO	NO
Reads and Writes FoxPro/.CDX Files	YES	YES	NO
Reads and Writes dBASE IV/.MDX Files	YES	NO	YES
Reads and Writes Paradox (.DB, .PXI) Files	YES	NO	NO

Comparison based on FoxPro Version 2.5 for DOS and dBASE IV Version 1.5



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■ Laser Printers

\$849 LaserJet 4L Proves that Small Is Beautiful

BY ALFRED POOR

Only the most jaded computer curmudgeon could walk past the new 4-page-per-minute, 300-dot-per-inch HP LaserJet 4L without cooing over its cute appearance. This printer is tiny—just 6.5 inches tall with a 14-by-14.5-inch footprint—and it tips the scales at a svelte 17.5 pounds. What's even smaller is the price: an astonishing \$849.

The printer's controls are the epitome of simplicity. Instead of a mass of membrane buttons and LCD message windows, there are four LED indicator lights and a single button. No power switch, no abbreviated messages—just one big button.

This simplified interface is made possible by a number of new and important features found in the LaserJet 4L. First, the printer's controller responds to the front panel button based on the context of the situation. For example, if there is data held in the printer's page buffer (indicated by the Ready and Data lights glowing steadily), the button serves as a Page Eject button. If the Data light is blinking, however (which indicates that the printer is in manual-feed mode and is waiting for a page to be inserted into the manual feed slot), a press of the button will override this setting and cause the printer to take a page from the paper bin.

Another feature is the high-speed, bidirectional Bi-Tronics parallel port, which speeds data

transmissions from the computer to the printer and lets the printer send information about its configuration to the computer. The



GRAPHICS: 300 dots per inch.

PC Magazine Labs Print
throughput report for: [LaserJ

ECONOMODE: Uses half the toner.

PC Magazine Labs Print
throughput report for: [LaserJ

REGULAR MODE: Sharp output.

HP Explorer utility program that comes with the printer takes the place of the front-panel menu system found on most other printers. You can specify settings such as default fonts and print quality, and can even save different configurations for different applications. The program also includes an interactive on-line manual for the printer.

ECONOMY PRINTING

While the printer has only 300-dpi resolution, it uses HP's Resolution Enhancement Technology (RET)

to provide the same high-quality text and line images created by the LaserJet III family of printers. The printer comes with 26 scalable fonts (as well as support for Windows TrueType fonts, including a Windows 3.1 driver.)

SAVING MONEY

In addition to RET, the LaserJet 4L introduces a new concept called EconoMode. In this optional draft-like mode, the printer only prints about half the dots needed to print a given page, cutting toner consumption by 50 percent. The result is a clear image that simply looks gray, compared with the normal solid-black laser output. It's a feature well-suited for draft prints.

The LaserJet 4L saves money in other ways. Instead of the power switch, the printer turns itself off and on. When idle, it goes into a power-saving mode that draws about 5 watts—which is equivalent to the power consumed by a typical night light. When it detects data arriving from the computer connection, it turns itself on. When the print job is over, it waits for a short time before going back into idle mode. This unique power-saving design qualifies the printer for the U.S. Environmental Pro-

tection Agency's "new Energy Star" designation.

In spite of all its compact design and energy-saving features, the LaserJet 4L, with its new Canon engine, is about as fast as the larger, more expensive HP LaserJet IIP Plus and IIP, which are based on the Canon LX engine. The LaserJet 4L managed 3.8 pages per minute in PC Magazine Labs' PCL Text Speed test, and 1.7 graphics pages per minute on the graphics test—close to the times posted by the LaserJet IIP. Hewlett-Packard says that EconoMode printing saves only toner, not time, and our tests bear that out: Speeds were identical for normal and EconoMode.

100-SHEET CAPACITY

The 4L has a paper tray that fits inside the case and has a 100-sheet capacity. The output tray holds 50 sheets, and a manual feed slot and face-up output slot provide a straight-through paper path for envelopes. The printer uses \$85 one-part toner and drum cartridges rated for 3,000 pages. The LaserJet 4L comes standard with 1MB of memory, which can only be upgraded to 2MB. According to HP, few users will need that additional memory because a new Memory Enhancement Technology compresses text and images so that most full-page images can fit in 1MB. If you need more than the PCL 5 support included in the 4L, HP plans to release a PCL and PostScript version, the LaserJet 4ML, later this summer for a list price of \$1,279.

With the LaserJet 4L, Hewlett-Packard Co. has proven once again that small can indeed be beautiful, and it's exciting to see that the size of the price tag matches the size of the printer.

• List price: *HP LaserJet 4L*, \$849; *Hewlett-Packard Co.*, 19310 Pruneridge Ave., Cupertino, CA 95014; 800-752-0900, 208-23-2551.

Circle 425 on reader service card



NEW LASERJET: A surprisingly small printer.

Database Report Writers

Crystal Reports 2.0: Sparkling Interface for Reporting

BY STEPHEN W. PLAIN

One of the most time-consuming parts of database application development is creating and maintaining database reports. Crystal Reports, Version 2.0, from Crystal Computer Services (\$195) not only simplifies that task but is also a single-product solution for producing high-quality reports across several popular database formats.

The Microsoft Windows-based package directly accesses database files to send reports to the printer, to the screen, or to a file. It includes a powerful WYSIWYG report designer that has a smooth drag-and-drop implementation. Properties of various objects in the reports are accessed via the right mouse button, and a toolbar presents common operations with refreshingly understandable icons.

they're called from within the host application. Since the DLL calls merely execute the .RPT file created from the report writer, changes in reports don't require modifications to the base program. A Visual Basic custom control new to Version 2.0 can be placed in the Visual Basic Toolbox to let characteristics of the report generation be accessed through Visual Basic's Properties dialog.

Crystal Reports supports Btrieve 5.0 and 6.0, Clipper, dBASE III Plus and dBASE IV, FoxPro 2.0 and 2.5, and Paradox 3.5 and 4.0. Native indexes can be used, including FoxPro's CDX indexes (which weren't supported in Crystal Reports' first release). You can use various formats together in the same report and establish links between files.

A File Links dialog box lets

Paradox 4.0 and another in dBASE IV and asked for an alias to be assigned to one.

A point-and-click dialog box lets you specify record-selection criteria that can be built from field values and choose from a wide selection of standard functions and operators. Custom functions can be easily designed and added. Full two-pass formula calculation is supported.

NEW TO VERSION 2.0

The improvements that have been made to Version 2.0 of Crystal Reports are impressive. One of the most attractive additions is an integrated report compiler that lets you produce an .EXE version of a report. Such a file can be distributed with the runtime module, CRRUN.EXE, to let users execute reports even if they don't have Crystal Reports. Unfortunately, CRRUN.EXE isn't mentioned either in the documentation or the standard READ.ME file. This critical information is located only in a text file on the distribution disk, which doesn't get copied to the hard disk during installation. Such an oversight can easily be forgiven; however, unlimited runtime reports can be distributed free of charge.

Version 2.0 also lets you insert .BMP, .GIF, .PCX, .TIFF, and .TGA graphics files into reports. That's great for producing form letters with company logos. A mailing label option that offers standard Avery styles and standard layouts for floppy disks and rotary file labels has also been added.

Another good addition is the ability to browse through the field values of the actual database files while you're designing a report. Seeing the data and

being able to decipher ambiguous field names is a big help. Many formatting tools have also been improved, and rudimentary line and box drawing tools are now available.

The only problem we encountered indicated some loosely designed error trapping. The package issued some erroneous error messages.

FACT FILE

Crystal Reports, Version 2.0

Crystal Computer Services Inc., 1050 W. Pender St., #2200, Vancouver, BC, Canada V6E 3S7; 604-681-3435; fax, 604-681-2934

List price: \$195; five-user LAN pack, \$395

Requires: 4MB RAM, 5MB hard disk space, Microsoft Windows 3.0 or later.

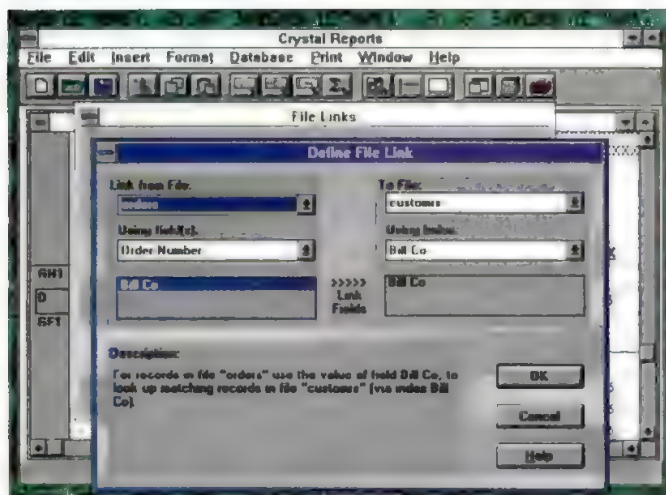
In short: Crystal Reports is a full-featured database report writer with an intelligent WYSIWYG interface and support for a wide range of database formats.

470 ON READER SERVICE CARD

PROFESSIONAL SUPERSSET

Crystal Services is readying Crystal Reports Pro, Version 2.0, a superset of Crystal Reports that will access Oracle, SQL Server, and Sybase tables. The new program will sell for \$395, and an upgrade from Crystal Reports will be offered for \$149. Since there is a well-known need for good Windows report writers for use with client/server front-end development, the Pro version is eagerly awaited.

Crystal Reports has an impressive amount of functionality for its price. It should appeal to consultants, MIS developers, and end users. It's already bundled with Borland's Paradox Engine and Object-Vision Professional, and it's a natural choice to augment other visual development environments like Visual Basic. Crystal Reports is a powerful addition to any database developer's arsenal of programming tools. □



LINK UP: Crystal Reports can combine data from multiple files.

A set of DLLs provides access to reports from ObjectVision, Turbo Pascal, Visual Basic, or any development environment that allows for calls to Windows DLLs. The reports are designed by Crystal Reports, but

you create relationships between database files with ease that rivals that of Access and Paradox for Windows. To our surprise, the linking tool detected an attempt to link two tables with the same name, one in

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■ Spreadsheet Utilities

Change Excel Cell Contents With Sliders & Dials

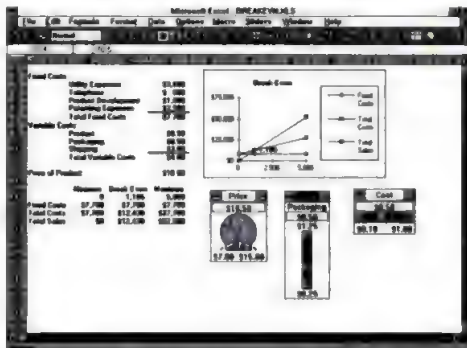
BY CRAIG STINSON

Golden Technologies' \$79.95 Sliders & Dials lets Microsoft Excel users attach attractive input controls to particular worksheet cells. Three types are available: horizontal and vertical scroll bars (sliders), and clock-like dials.

No macro programming is required. You simply pull down a Sliders menu (attached automatically if you put the program's .XLA file in your XLSTART directory), choose the Create command, and fill out a simple dialog box. You specify a label for the control, a display format for the affected cell, and the control's step value (the amount by which the input cell is increased or

decreased with each click on the slider or dial).

Applications for Sliders & Dials include any worksheet model in which you want to vary one or more input values and test their effect on output cells;



CONTROLS: Add a slider or dial to any cell.

in other words, it's good for when you have a myriad of spreadsheet tasks. In a break-

even analysis, for example, you might attach controls to each cell in which a cost or income factor is stored. Then you could play what-if simply by clicking scroll bars or dials rather than by editing cells directly.

Unfortunately, this first release is marred by several design and implementation glitches. Controls don't maintain their spatial relationships with underlying worksheets between sessions. You need to rearrange windows every time you open a worksheet in which you've created sliders or dials.

Moreover, with multiple open worksheets, the controls don't remain visually attached to their associated worksheets. You can create a great deal of visual bewilderment in short order merely by alternating the input focus. (Golden says this behavior is advantageous because it lets you control inputs even on worksheets that are hidden behind other win-

dows. Even so, this procedure should be optional, not mandatory.)

Matters get worse if you switch between applications. Let's say you Alt-Tab from a worksheet with sliders to another program. Under normal Windows behavior, a subsequent Alt-Tab would restore your Excel-with-sliders display exactly as you left it. In this version, that "return" Alt-Tab simply plants your Sliders & Dials on top of whatever application you switched to.

Finally, Sliders & Dials interferes with customary Excel behavior, potentially causing havoc for macro writers. Worksheets with controls attached are automatically tagged as dirty, whether or not you alter the worksheet.

● List price: \$79.95. Requires: Microsoft Excel 4.0 or 4.0a, Microsoft Windows 3.x. Golden Technologies Inc., 14251 Camden Ln., Lake Oswego, OR 97035; 800-653-2201, 503-620-2201.

Circle 422 on reader service card

■ Windows Utilities

XTree for Windows 1.5: Now Programmable

BY BARRY SIMON

Version 1.0 of XTree for Windows set a new standard in Microsoft Windows file management, and less than six months later, XTree Co. is back with improvements to the \$99 program.

Version 1.5 adds additional features to the XTree core, most notably printer and editor support and text searching. But the big news is a button bar builder connected to a complete scripting language.

XTree for Windows' main file menu now has a print command that will print the text from a variety of word processor files (but not with the proper fonts) and several kinds of graphics files (.GIF, .PCX, .TIFF, .WPG, and .WMF, but not .CGM or JPEG). It doesn't print

spreadsheets or database files (although the viewers work fine with these types).

Also new are AutoCAD viewers, text searching across files, and drag-and-drop support from XTree for Windows to any application that can be a drag-and-drop client.

The most significant enhancement is a second, built-in program called XTree Command Center (XTCC). XTCC button bars can launch programs or be attached to applications as macro buttons.

The buttons can run scripts written in a variant of BASIC which has the While/Wend, Do/Loop, For/Next, and If..Then..Else control structures familiar to BASIC programmers. Also included are dialog boxes, DDE and DLL calls, commands to simulate mouse clicks and key-

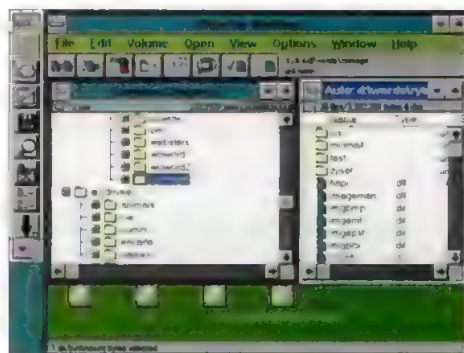
board entries, and commands to call menu items and fill in dialog boxes. You can record scripts, but there is no dialog editor.

The button bars can be dynamically resized, and you rearrange buttons by dragging them to their new locations. Sample bars are included to make XTree for Windows understand the hotkeys used by XTree for DOS.

Version 1.5 of XTree for Windows is a strong upgrade. The core file manager remains at the top of its class, and the button bars are of comparable quality to those found in hDC

Power Launcher, Synergy, and WinMaster.

● List price: \$99; upgrade from any XTree version, \$19.95; upgrade from DOS version, \$59.95. Requires: 2MB RAM,



PROGRAMMABLE: XTree for Windows' new buttons can run scripts.

2.2MB hard disk space, Microsoft Windows 3.x. XTree Co., 4115 Broad St., #1, San Luis Obispo, CA 93401; 800-395-8733, 805-541-0604; fax, 805-541-4762.

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If Gateway 2000 was a record, what would we sound like? Music to your ears!

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in the heartland of America where our factory is bordered by corn and bean fields. KSUX country radio, the Super Pig, is the number one station in these parts (no fooling). Gateway folks are mostly midwest born and raised, and it shows in our quality workmanship and in the friendly, down-home way we treat our customers. We'll bend over backwards to please you. When you buy from Gateway, you get the best price, quality and service. That's a value nobody can beat.



Gimme the Good Stuff –
by Hammer and the Boys

This song is dedicated to everybody who's tired of new technology becoming affordable only after it's upstaged by something better. At Gateway, we offer the latest, newfangled technology at homespun prices.

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by The Support Group

Every Gateway 2000 system comes with excellent after-the-sale support. You get a **30-day money-back guarantee**. If you don't like your system, send it back within 30 days for a refund. All systems come with a **one-year limited warranty** and telephone **technical support** for the life of the system from our award-winning tech department. We received *PC World's* World Class Award in 1992 for best service and support in the hardware category. And in a February 1993 survey, *PC Magazine* readers once again gave Gateway an excellent rating for service and reliability. You also get an **automated fax service** to supply you with detailed documentation on over 150 technical subjects, and a **lifetime BBS membership** for additional technical support and online forums.

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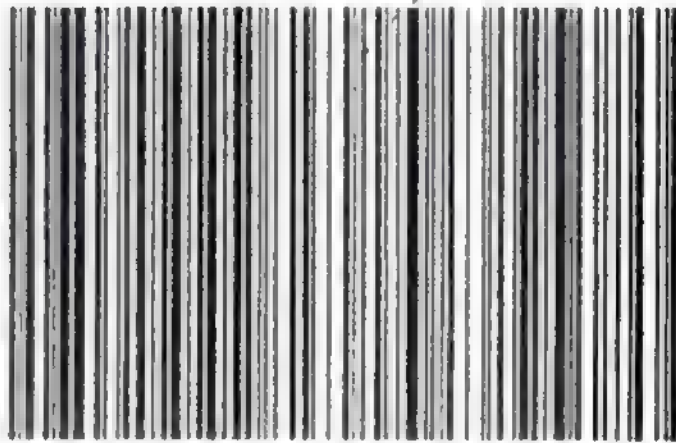
To serve you better, we've hired and trained over 600 new people for customer service, technical support, sales and manufacturing in the past six months, bringing our total number of employees to over 2,000.



1. Follow instructions on the other side

Back

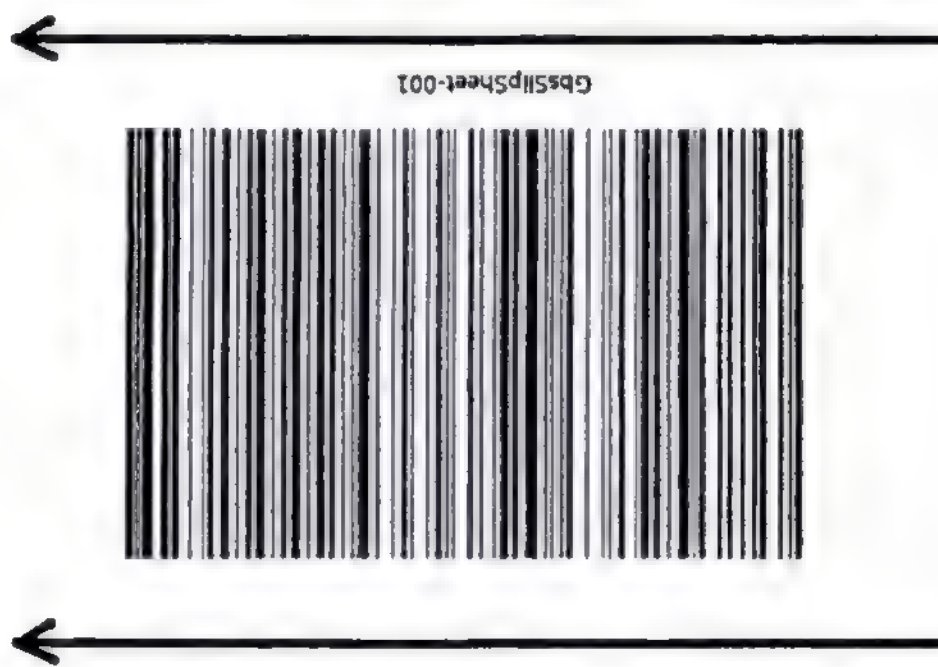
Gbs51pBack-0018



Inverted Back

1. Follow instructions on the other side

Folded edge of the page



Inverted Foldout slip-sheet

Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Cow



Because We're Playing Your Song!

If Gateway 2000 was a record, we'd be receiving a platinum award – thanks to all of our wonderful customers. Our one-millionth computer system was shipped in April from our factory in North Sioux City, South Dakota. A million is a number that's hard to fathom. At least it is for us.

We send our deepest appreciation to each and every Gateway customer. Thank you for believing in us. We've tried hard to always offer you the best value in the personal computer industry. We've succeeded in meeting this goal, although we're the first to admit that demand for the value we offer has sometimes overwhelmed us. We thank you for the understanding and patience you've shown during our growth spurts.

We also want to thank our remarkable vendors – the companies that supply us with the highest-quality, most technically-advanced components, software and peripherals, and those that provide support services. Gateway 2000 has been a most demanding customer, and they deserve a lot of credit for our success.

Now our goal is to make the next million even better, one computer and one customer at a time!





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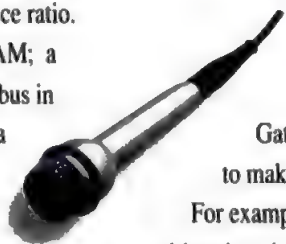
We Got the Goods – by *The Systematics*

Gateway's album would continue with some heart-pounding rock 'n roll cuts because our systems are definitely pure rock. They're cool-looking, hot-performing, high-energy machines – at some sweet prices. There's a model that's perfect for you.



Megahertz So Good – by *Pup and the Cells*

Gateway's mini-desktop systems – 3SX-33, 4SX-33 and 4DX-33 – are petite but plenty powerful, based on an integrated design that incorporates many subsystems on the motherboard for the best price-performance ratio. All mini desktop systems include: 4 to 8MB RAM; a large and fast hard drive, operating on the local bus in 486 models for even faster drive performance; a fast video chipset with 1MB; a brilliant, crisp display from the standard 14-inch CrystalScan non-interlaced color monitor; and more available expansion slots than you find in most small-footprint PCs. The combination of these features makes a cool Windows machine for an unbeatable price.



So You Wanta Fly? – by *The Screamin' Vs*

Power users, pick up the phone and order a Gateway 2000 VESA® local bus 486 machine right now. You'll never regret it. With our 4DX2-50V or 4DX2-66V models, you get screaming PC performance. We put ATI's Graphics Ultra Pro video card with 1MB VRAM on our VESA local bus for results that are simply awesome! Plus these systems have a hefty 8MB RAM with cache, and hard-rockin' hard drives running on the local bus. An extra VESA local bus expansion slot as well. You get a 15-inch flat, square CrystalScan color monitor and more choices of cool application software than you'll find anywhere else. Our award-winning 4DX2-66V now includes a CD-ROM drive, too!

Big Bandwidth Boogie – by *The Gates*

If you're looking for the 32-bit power of an EISA system, we offer three models – 4DX-33E, 4DX2-50E and 4DX2-66E. All models include: 8MB RAM with 256K cache; a very large, very fast SCSI hard drive; 32-bit EISA SCSI controller; and a standard tower case. Please call for details and prices on models not listed on our price page.



Workin' Up Some New Riffs – by *The Harmonics*

This one's our theme song. At Gateway, we're always looking for ways to make your PC easier and more fun to use. For example, we now install a Mach 32 video driver icon in your Windows control panel so you can change your video resolution quickly and easily.

All Gateway systems go through extensive compatibility testing to ensure flawless performance with all products from major software developers and peripherals manufacturers.



800-846-2063

◀ According to PC World, "(Gateway 2000's 4DX2-66V is) by far the fastest machine we've ever tested!"



IS THAT

WORD



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WINDOWS
FOR WORKGROUPS

WORD
2000





Windows to the Other Side – by Tommy Gee

Gateway's album would also include jazz favorites because we offer a complete line of software and peripherals to make your system extra cool.



New Sensations – by The Cool Tools

New this month is the introduction of Microsoft MS-DOS® 6 plus Enhanced Tools, standard on all Gateway systems. Microsoft says it's "the best version of MS-DOS yet." MS-DOS 6 includes features that can increase hard drive capacity, protect your data, free up memory – and much more.

The software and peripherals listed here are sold only with the purchase of a system.

*For details on our complete line of extras for Gateway customers, call direct to our special add-on components division:
800-846-2080.*

Moovin' Up – by The Upgrade Express

For a limited time, Gateway customers can upgrade to MS-DOS 6 for only \$48, plus \$5 shipping and handling. You get a complete set of disks and a manual for this special price. To order, call our express upgrade number – 800-846-2037 – or fax us your order at 800-846-2038. We need your customer ID, credit card information, and your choice of 3.5-inch or 5.25-inch disks to place your order. Special price offer ends May 31, 1993.



Software Improv – by Good Vibes

All Gateway systems come with some very hip software, all pre-installed and ready to run the moment your PC arrives. With mini desktop, desktop and tower systems that include "choice of application software," you get to pick one of the following applications, all latest versions:

- Microsoft® Excel for Windows™
- Microsoft Word for Windows™
- Microsoft Word and Bookshelf 92® CD
- Microsoft PowerPoint for Windows™
- Microsoft Project for Windows™
- The MS Entrepreneur Pack (Works,™ Publisher,™ Money,™ and games)
- Borland Paradox® for Windows™
- The Windows Programmer Pack (MS Quick C,™ Visual Basic and more)
- Upgrade to Microsoft Office™ for \$175 (CD-ROM Edition also available)

Connectivity – by The Local Area Group

TelePath™ Fax/Modem. A 14,400bps modem, V.32bis, with 9,600bps fax capability. Includes WinFax Pro, Crosstalk for Windows, Qmodem. \$195

Network Cards. Call for a selection of Ethernet cards and Token Ring adapters, installed and configured.

Microsoft Windows™ for Workgroups. Networking made easy! Price includes an Ethernet adapter and software. Hardware and software factory-installed. \$159

WOW – by Talking Pictures in Motion

CD-ROM Kit. Includes CD-ROM, interface card and everything you need to add MPC-compliant CD-ROM to your PC. \$225

Microsoft Windows Sound System.™ Package includes sound board, microphone, headset and software. \$149

Multimedia Accessories. Call for details on other multimedia hardware and software.

We offer many other system options and upgrades, including 17" and 20" monitors, tape backup units, Texas Instruments laser printers, Panasonic dot-matrix printers, bigger hard drives, other software and more. Call today!

◀ Gateway's 4DX-33V is shown here with Windows Sound System components, the CD-ROM kit and optional speakers. Call for details on this system.



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Gateway 2000's Platinum Hits

Desktop Systems

3SX-33

- 33MHz 386SX Intel® Processor
- 4MB RAM
- 5.25" & 3.5" Diskette Drives
- 80MB 17ms IDE Hard Drive
- Windows Accelerated Video w/ 1MB DRAM
- 14" Color CrystalScan™ 1024NI
- Mini Desktop Case
- 5 16-Bit ISA Slots
- 124-Key AnyKey® Keyboard
- MS-DOS® 6, Diags, Windows™ & Mouse
- MS Works for Windows™ 2.0

\$1295

4SX-33

- 33MHz 486SX Intel Processor
- 4MB RAM
- 5.25" & 3.5" Diskette Drives
- 170MB 13ms IDE Hard Drive
- Local Bus IDE Interface
- Intel OverDrive Socket
- Windows Accelerated Video w/ 1MB DRAM
- 14" Color CrystalScan 1024NI
- Mini Desktop Case
- 5 16-Bit ISA Slots
- 124-Key AnyKey Keyboard
- MS-DOS 6, Diags, Windows & Mouse
- MS Works for Windows 2.0

\$1495

4DX-33

- 33MHz 486DX Intel Processor
- 8MB RAM, 64K Cache
- 5.25" & 3.5" Diskette Drives
- 250MB 13ms IDE Hard Drive
- Local Bus IDE Interface
- Intel OverDrive Socket
- Windows Accelerated Video w/ 1MB DRAM
- 14" Color CrystalScan 1024NI
- Mini Desktop Case
- 5 16-Bit ISA Slots
- 124-Key AnyKey Keyboard
- MS-DOS 6, Diags, Windows & Mouse
- MS Works for Windows 2.0

\$1995

4SX-33V

- 33MHz 486SX Intel Processor
- 8MB RAM, 64K Cache
- 5.25" & 3.5" Diskette Drives
- 250MB 13ms IDE Hard Drive
- Local Bus IDE Interface
- Intel OverDrive Socket
- ATI Ultra Pro Video w/ 1MB VRAM on VL-Bus™
- 15" Color CrystalScan 1572FS
- Desktop Case (Tower Upgrade)
- 8 16-Bit ISA Slots, 2 on VL-Bus
- 124-Key AnyKey Keyboard
- MS-DOS 6, Diags, Windows & Mouse
- Choice of Application Software

\$2195

4DX2-50V

- 50MHz 486DX2 Intel Processor
- 8MB RAM, 64K Cache
- 5.25" & 3.5" Diskette Drives
- 250MB 13ms IDE Hard Drive
- Local Bus IDE Interface
- Intel OverDrive Socket
- ATI Ultra Pro Video w/ 1MB VRAM on VL-Bus™
- 15" Color CrystalScan 1572FS
- Desktop Case (Tower Upgrade)
- 8 16-Bit ISA Slots, 2 on VL-Bus
- 124-Key AnyKey Keyboard
- MS-DOS 6, Diags, Windows & Mouse
- Choice of Application Software

\$2495

4DX2-66V

- 66MHz 486DX2 Intel Processor
- 8MB RAM, 256K Cache
- 3.5" Diskette Drive AND CD-ROM Drive ◀
- 340MB 13ms IDE Hard Drive
- Local Bus IDE Interface
- Intel OverDrive Socket
- ATI Ultra Pro Video w/ 1MB VRAM on VL-Bus™
- 15" Color CrystalScan 1572FS
- Desktop Case (Tower Upgrade)
- 8 16-Bit ISA Slots, 2 on VL-Bus
- 124-Key AnyKey Keyboard
- MS-DOS 6, Diags, Windows & Mouse
- Choice of Application Software

\$2995



4DX2-66E

- 66MHz 486DX2 Intel Processor
- 8MB RAM, 256K Cache
- 5.25" & 3.5" Diskette Drives
- 500MB 11ms SCSI Hard Drive
- 32-Bit EISA SCSI Controller
- Intel OverDrive Socket
- Windows Accelerated Video w/ 1MB DRAM
- 14" Color CrystalScan 1024NI
- Tower Case
- 8 32-Bit EISA Slots
- 124-Key AnyKey Keyboard
- MS-DOS 6, Diags, Windows & Mouse
- Choice of Application Software

\$3495

Software Options

With systems that include "choice of application software," pick one from this selection:

- Microsoft Excel for Windows
- Microsoft Word for Windows
- Microsoft Word and Bookshelf 92 CD
- Microsoft PowerPoint for Windows
- Microsoft Project for Windows
- The MS Entrepreneur Pack (Works, Publisher, Money and games)
- Borland Paradox for Windows
- The Windows Programmer Pack (MS Quick C, Visual Basic and more)

You can also upgrade from MS Works to a choice of software for \$100, or upgrade from these choices to MS Office for \$175.

Service

Every Gateway 2000 system is backed by:

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- One-Year Limited Warranty
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- On-Site Service Available to Most Locations
- Lifetime BBS Membership
- Automated Fax Service

All hard drive sizes are manufacturer's specified capacities. Microsoft MS-DOS 6 can increase hard drive capacity through software compression.



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■ Notebook PCs

ZDS Z-Note 425Ln: 6.5 Hour Battery Life

BY JOHN R. QUAIN

Finally, a notebook PC that won't run out of battery power on a flight from L.A. to New York. Without using any of its power-saving features, Zenith Data Systems' \$2,599 Z-Note 425Ln lasted a remarkable 4 hours 33 minutes in PC Labs' Battery Rundown test, more than 2 hours longer than the next best 25-MHz 486SL-based notebook we've tested. And when the Z-Note's suite of power-saving controls is enabled, the unit takes nearly 6 and a half hours to run out of steam in the ZDigit test.

In addition to its front-running nickel hydride battery life, the Z-Note 425Ln's performance compares very favorably to current notebooks and quite well against three other 486SL notebooks we've tested—the Compaq LTE Lite 4/25C, the AST PowerExec 4/25 SL, and the NEC Versa. The Z-Note did not quite match the performance of the Versa, but easily beat the Compaq entry and ran a shade behind the AST model.

In its tested configuration, the 5.9-pound Z-Note 425Ln comes with 4MB of RAM, a 120MB hard disk, an internal 1.44MB floppy disk drive, Flash EEPROM BIOS, DOS 5.0, Microsoft Windows 3.1, Windows for Workgroups, and preinstalled network client shells for LAN Manager, NetWare, and VINES. Corporate users will also be pleased to find an on-board Ethernet adapter, though you'll need an \$89 Friendly Net adapter (thin or twisted wire) to make a BNC connection.

The Z-Note's rugged construction and no-fuss ergonomics shine. The system's monochrome backlit passive-matrix VGA screen is legible from most angles, and the 82-key keyboard

is comfortable to use and has a full set of 12 function keys with cursor keys arranged in an inverted T. Though the system lacks a built-in pointing device, ZDS includes a Logitech TracMan that clamps easily to the side of the notebook.

The one missing item: a PCM-

CIA slot. Nonetheless, the Z-Note 425Ln can accommodate either a \$499 14.4-Kbps or \$279 9,600-bps fax/modem card. If you



LOADED: LAN-ready Z-Note.

■ Multimedia

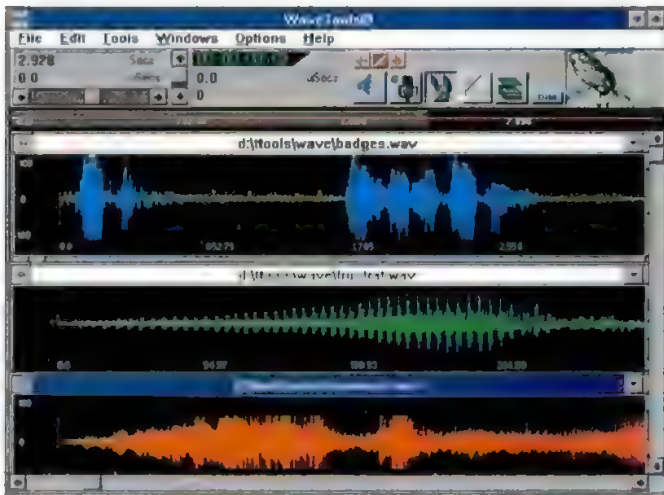
Turtle Tools Makes Editing Sound Files Easier

BY ROBERT KENDALL

Turtle Beach Systems makes coping with the different sound-file formats supported by Microsoft Windows easier with The Turtle Tools for Multimedia, a first-rate \$89 collection of editors and utilities for handling digital audio .WAV files, MIDI music files, and audio CD tracks on a CD-ROM.

on the market. On slower PCs it is less likely than many competitors to choke on dense streams of 16-bit sound data, and it imposes no limit on the length of the recorded file. A record/pause button lets you use the program's level meters to set your recording level before you start recording, saving a lot of headaches.

For editing digital audio,



CATCH THE WAVE: View and edit digital audio .WAV files.

The best of these utilities is WaveTools, a scaled-down version of Wave for Windows, the vendor's high-end .WAV file editor. It retains many of the features that make Wave one of the best 16-bit .WAV file recorders

WaveTools displays the waveforms of each stereo channel in your file, letting you cut and paste sections, overlay sounds on top of each other, create fade-ins, fade-outs, and loops, and remove clicks and pops. You

must use the Z-Note at your office, a \$79 port replicator lets you conveniently connect AC power, an external keyboard, and monitor. But with system performance and battery life like this, why work in the office?

• List price: Z-Note 425Ln with 4MB RAM, 120MB hard disk, DOS 5.0, Windows 3.1, Windows for Workgroups, \$2,599. Zenith Data Systems, 2150 East Lake Cook Rd., Buffalo Grove, IL 60089; 800-553-0331, 708-808-5000; fax, 800-472-7211.

Circle 404 on reader service card

can't convert files to a lower sampling quality to save disk space or create special effects such as echo, however.

You will surely find MIDI Tune-Up to be a uniquely unimimidating tool for making simple edits to MIDI files. It provides a graphical mixer window with a level meter and mute button for each track, as well as sliders you can move with the mouse to adjust volume. You select instruments from a pop-up list.

If you want to cut and paste MIDI files, edit individual notes, or record from a keyboard, you turn to Midisoft Recording Session. This simple sequencer displays your MIDI file in staff notation, letting you edit it by dragging notes with the mouse.

Other utilities extend Windows' capability to attach sounds to various system events (such as launching a program) and let you play and record music using the PC keyboard instead of a MIDI keyboard. There's a program for playing audio CD tracks from a CD-ROM, but this proved very erratic in our testing. To top it all off, you get a handful of MIDI files and a CD-ROM of 300 sound effects.

• List price: The Turtle Tools for Multimedia, Version 1.0, \$89. Requires: 2MB RAM, Microsoft Windows 3.1, Windows-compatible sound card; CD-ROM drive recommended.

Turtle Beach Systems Inc., 1600 Pennsylvania Ave., #33, York, PA 17404; 717-843-6916.

Circle 403 on reader service card

PCs

Lexar DX2/66 Features Interchangeable I/O Path

BY BRUCE BROWN

Today's performance bottlenecks don't happen in the processor or in memory, but rather in the I/O bus. Though EISA works for file servers, PC vendors are moving to local-bus technology to speed the performance of video cards and disk controllers. The standard is in flux: OPTi's local bus came and went, VESA's VL-Bus is here now, and Intel promises PCI (Peripheral Component Inter-

connect) for later this year.

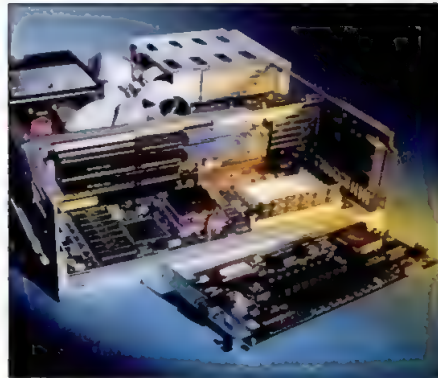
For buyers who want to hedge their bets, Lexar Systems has a solution: a line of desktop systems that let you install ISA, VL-Bus, and, eventually, PCI cards on the same motherboard.

Lexar produces upgradable 486-based PCs ranging from 20-MHz 486SX to 66-MHz 486DX2 systems. We tested a \$3,462 66-MHz system with 8MB RAM, a 256K RAM cache, VL-Bus video and hard disk controllers, and a 200MB Conner hard disk.

Each Lexar motherboard has a 238-pin Intel OverDrive socket for 486 or Pentium upgrades

You can choose an ISA, OPTi local bus, or VL-Bus riser card. (OPTi and VL-Bus slots also accept ISA peripheral cards.) PCI and PCMCIA riser cards are under development, awaiting final bus standard specifications. If you start with an ISA system, upgrading to local bus currently costs \$104.

Each Lexar system comes in a small-footprint case, 4.3 by 16.3 by 15.8 inches (HWD), with



INSIDE: A replaceable riser card.

and a single 32-bit bus slot that supports a replaceable riser card with five additional I/O slots.

four drive bays. An upcoming tower system will have more bays and an extended bus riser card with more than the current version's five interface card slots.

Processor and memory benchmark test scores for the Lexar system were average compared with other 66-MHz systems, but the accelerated VL-Bus video card powered the system to better-than-average DOS video and Graphics Winmark scores. The Conner IDE hard disk achieved a score slightly below average, despite the system's 2MB caching disk controller.

If you upgrade often and don't want to be stuck with an obsolete I/O bus standard, the Lexar solution is a good one. Though the systems carry a slight premium over comparable fixed-bus computers, their street prices should be roughly 10 percent below list. Lexar sells only through dealers and VARs, and systems are serviced through that channel.

● List price: *Lexar VESA High Performance Workstation*, with 8MB RAM, 256K RAM cache, 200MB hard disk, two floppy disk drives, 15-inch Lexar MultiSync Hi-Res Monitor, DOS 5.0, Windows 3.1, and mouse, \$3,462. Lexar Systems, 301 N. Harrison St., Princeton, NJ 08540; 609-252-0086; fax, 609-683-0071.

Circle 430 on reader service card

Business Forecasting Software Forecast Pro's Expert Mode Helps You See the Future

BY THERESA W. CAREY

Business Forecast Systems, which released Forecast Pro for Windows late last year, has now updated its \$595 DOS version to include all the new features that the Windows version enjoys.

Regardless of your familiarity with business-forecasting techniques, the Expert mode of Forecast Pro for DOS, Version 2.0, offers an extremely useful helping hand that takes you through the process of selecting the appropriate method for analyzing your data. The program's weakness is that its focus is on processing data rather than on entering or reporting on it; you must rely on spreadsheets and word processors to perform those tasks.

Forecast Pro includes three univariate forecasting methodologies (simple moving average,

exponential smoothing, and Box-Jenkins) as well as dynamic regression for multivariate analysis. The Expert mode will analyze a time series for you and let you know which of the univariate techniques fits it best. Forecast Pro lets you analyze each series interactively, producing a report that tells you how well the technique works. Once a forecast has been calculated, a click shows the data and

the results of any analysis you perform during a session are stored. You can import the Audit Trail file into a word processor if you want to create more presentable reports, but the only reporting the program itself does is limited to tables showing the calculated forecasts.

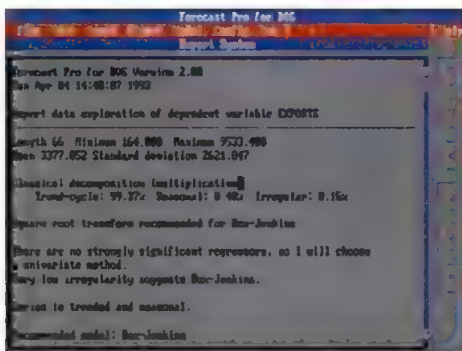
Data entry is another task usually performed outside Forecast Pro, either by creating ASCII files containing variables or by importing a spreadsheet in .WK1 format.

Once a time series is imported and selected for analysis, creating a forecast is as simple as clicking on the Expert button. Things speed up considerably if you have more than 2MB of RAM and a math coprocessor.

If you need to churn out a quick forecast, Forecast Pro will do the job. The Expert mode offers a helping hand to novices, and there's enough flexibility in the program for forecasting professionals, too.

● List price: *Forecast Pro for DOS, Version 2.0*, \$595; upgrade from Version 1.x, \$199 through May 31, 1993. Requires: 2MB RAM, 1MB hard disk space, DOS 2.0 or later. Business Forecast Systems Inc., 68 Leonard St., Belmont, MA 02178; 617-484-5050; fax, 617-484-9219.

Circle 426 on reader service card



CONSULTANT: Expert mode does the work.

the forecast within confidence limits you can set.

Forecast Pro's opening screen shows the beginning of the session's Audit Trail, where

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■ Communications Software

\$149 WinBEEP Sends Messages to Alphanumeric Pagers

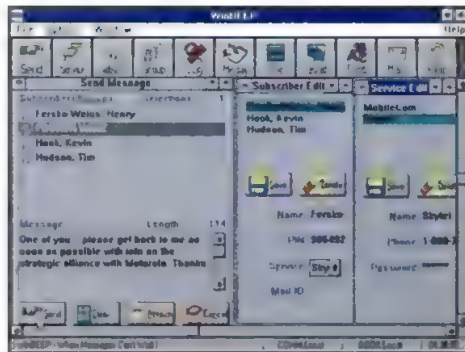
BY HENRY FERSKO-WEISS

Some messages are so critical they can't wait for you to dial into your electronic mail. Now you don't have to wait—no matter where you are. With Fourth Wave Technologies' \$149 WinBEEP for Microsoft Windows, Version 1.03, and a full-text, alphanumeric pager, your messages can reach you even if you happen to be in the middle of a meeting thousands of miles from home.

WinBEEP is an extremely easy program to learn because it

has just a few features. You create two simple databases: one with the names and ID numbers of people who can receive messages; the other with the communications parameters for the services that carry the messages, such as SkyTel or MobileComm.

You compose messages of up to 2,000 characters in a Send window that has a scrollable list of people's names to select from. Broadcasting a message to sev-



BEEP ME: You can write messages of up to 2,000 characters in WinBEEP's Send window.

eral people at once is easy. Also on-screen is a box that tells you the length of the message you've

typed. This is important information because pager services usually limit their message sizes to between 80 and 200 characters. Although WinBEEP automatically breaks up long messages that exceed this limit into several continuous pages, it's a bit cumbersome to receive and read more than a few such pages on a pager. The typical pager can hold as much as 6K of information and up to 40 messages.

Other WinBEEP tools let you set up groups of people in your electronic phone book. You can also view log

files, create predefined messages, as well as send messages to individual mailboxes if you use cc:Mail or Microsoft Mail. WinBEEP now supports both Lotus's VIM and Microsoft's MAPI e-mail systems, and is slated to support Novell's MHS interface later this year.

WinBEEP comes either as a standalone or in a \$495 network version, which uses Network Dynamic Data Exchange to enable users to share a common modem and pager phone book. If Windows for Workgroups is running, WinBEEP detects this during installation and lets users access each other's local modems and personal phone books.

WinBEEP gives you just enough functionality to perform its one very specialized operation, and it does its job with admirable simplicity.

• **List price:** WinBEEP for Microsoft Windows, Version 1.03, \$149; network version for one server and one user, \$495; five-user pack for network version, \$495. Requires: 2MB RAM, 1.5MB hard disk space, Hayes-compatible modem, alphanumeric pager, Microsoft Windows 3.1 or Windows for Workgroups. Fourth Wave Technologies Inc. 560 Kirts Blvd., #105, Troy, MI 48064; 313-362-2288; fax, 313-362-2295.

Circle 402 on reader service card

■ Integrated Software

\$79 Surefire Combines WP, Database, Spreadsheet

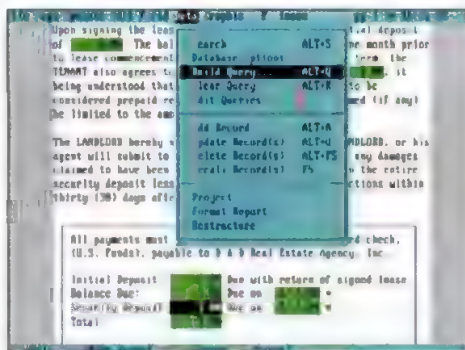
BY J.W. OLSEN

Surefire: The Smart Document Processor, Version 2.0, from Piaf Inc., packs a surprising array of features into a \$79 package—at about half the price of other low-end integrated products. Surefire is marketed as shareware and starting in May, it will be sold retail as well. Version 1.0 of the program was the 1992 Best New Product winner of the Shareware Industry Awards. If you create documents with text, databases, and spreadsheet calculations, Surefire is a good tool for combining all three.

Surefire can serve as a basic word processor, but its strength lies in the relative simplicity with which document data may be saved to and retrieved from databases. Unique among its competitors, Surefire makes its features accessible within a single environment, rather than in separate modules.

Suppose you send a proposal

to several clients. Favorable responses will call for thank-you letters. Other proposals that involve more than a certain dollar amount may need follow-up letters. Surefire can tie these steps into a coordinated task. You begin by designing a data entry screen with numeric, character-string, logical, and date fields, per-



EASY DOES IT: Surefire's data, text, and spreadsheet features are always available.

haps separating elements with easily created boxes and boldface. Then you create your proposal and letters, including placement of data fields. Returning to the

data-entry screen, you enter your initial data.

You then manually load your proposal and instruct Surefire to fill in and print a copy for all clients, or for a group identified through query by example and you can do the same with your letters.

Piaf anticipates user needs well with Surefire's feature set, but should focus more attention upon occasional glitches in the interface. A less serious nuisance: Created data fields become a character or digit longer than expected. (The cursor hides the last position of a field, which becomes evident only after you move the cursor.)

Despite some rough edges, Surefire: The Smart Document Processor offers a lot of bang for the buck for DOS users with moderate needs to integrate text, data, and calculations.

• **List price:** Surefire: The Smart Document Processor, Version 2.0, \$79. Requires: 640K RAM, DOS 3.1 or later. Piaf Inc., 3918 Orchard Ct., Boulder, CO 80304; 303-786-8222.

Circle 401 on reader service card

■ Graphics Software

Ventura PicturePro: Powerful Editing and Masking Tools

BY LORI GRUNIN

Ventura Software enters the crowded paint and image-editing software market with an extremely capable \$795 professional-level package combining excellent masking and compositing tools, flexible paint tools, and a good set of special effects. Although PicturePro emulates many of the capabilities of Adobe Photoshop (see page 37) and Fractal Design Painter (First Looks, May 11, 1993), it does so within its own distinctive interface design.

You work in one of three modes: Paint, Alpha, or Draw. In Draw mode you create objects in geometric shapes and free-form Bezier curves. As in any illustration package, you can stack and rearrange these objects. If you add a fill to the objects, they are copied to the underlying image as a bitmap; without fills, they become selection areas. Ventura's .VIP file format stores the Draw layer (and the Alpha layer) separately, leaving it editable until you choose to render it to the background image. EPS files can be imported, edited with the Bezier tools, and used as masks as well.

The Draw mode adds flexibility to PicturePro in two important ways. First, text entered on the Draw layer remains editable until you render it to the image. Second, in Draw mode the program offers strong Bezier editing tools—you edit nodal transitions in line, curve, cusp,

smooth, symmetric, and asymmetric variants. In addition, you can convert objects and text to Beziers.

You perform all image editing and painting in Paint mode. PicturePro offers the usual wide array of special-effects filters (it also supports third-party plug-in filters), color-correction tools,

shop, but it achieves the same sophisticated effect of combining two images using the transparency characteristics of a third. The program supports Twain as well as scanner-specific drivers for image input, and has extremely sophisticated color-separation tools.

CLEAR AND CONSISTENT

Overall, PicturePro has an extremely usable and consistent interface: Ctrl-click pulls up the options for any tool on the floating tool palette, and clicking on various areas of the other palettes brings up most of the options available from the drop-down menus.

While in practice the Ctrl-click approach works pretty well, it does mean that you need to use two hands, which can occasionally be awkward. In addition, some of the elements that you need to access relatively frequently are just one level too deep.

The product is also missing some capabilities, such as the capacity to convert to or edit 8-bit images. As a photo retouching tool, it's as competent as

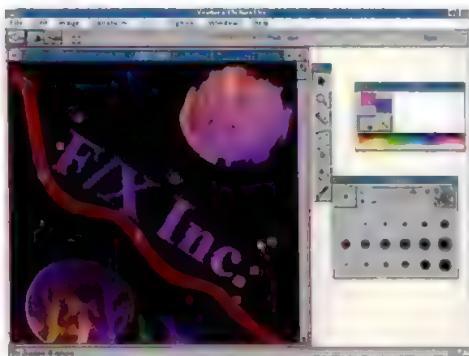
most products but doesn't compare to Photoshop. And while its masking tools are excellent, PicturePro could use more sophisticated color masking, like that of Micrografx's Picture Publisher.

PicturePro also needs a tune-up when it comes to performance: Even working with a small image (768K) and starting out with a reasonable amount of virtual memory for an image that size (13MB free), the machine slowed to a crawl after an hour and we experienced excessive hard-disk thrashing. (We tested on a Gateway 4DX2-66V equipped with 8MB of RAM and an ATI Ultra Pro VLB graphics adapter running in 24-bit mode at 800-by-600 resolution.)

Taken individually, Ventura PicturePro's strengths don't really distinguish it from its competition, but taken together, the program's excellent Bezier-editing, masking, and painting tools make it a powerful professional image-creating and editing choice.

● **List price:** Ventura PicturePro, Version 1.1, \$795. **Requires:** 4MB RAM, 10MB hard disk space, Microsoft Windows 3. mouse; 8MB RAM, digitizing tablet, and math coprocessor recommended. **Ventura Software Inc., 15175 Innovation Dr., San Diego, CA 92128; 800-822-8221, 619-673-0172; fax 619-673-7784.**

Circle 428 on reader service card

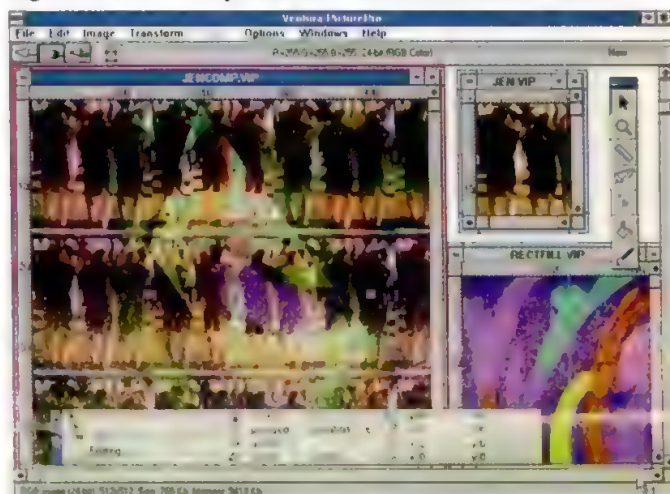


TEXT IN: You can create text in Draw mode, transform it, and copy it to the Paint layer.

and transformation functions (such as skew, rotate, and perspective). Images can be converted to the CMYK color space, but you can use the tonal map and correction tools only for CMYK editing.

In Alpha mode, all selections are treated as 8-bit masks that you edit with all of the program's paint tools. These tools, which include brush strokes that carry names such as Grainy Soft Oil Brush and Dirty Felt Pen, and loadable paper textures called PixelPaper, bear a striking resemblance to those found in Fractal Design Painter. They're not quite as realistic looking as Painter's, but they're still quite good. You control a myriad of advanced stroke characteristics as well as the interaction between the strokes and the PixelPaper.

PicturePro approaches compositing differently from Photo-



ATTRIBUTES: Transform, place, and shape selections.

New dBASE IV v2.0 gets you home for dinner



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dBASE IV outfoxes the competition

	dBASE IV	FoxPro
Industry standard	Yes	No
Designed for users	Yes	No
Designed for programmers	Yes	Yes
Queries optimized for stand-alone & networked computers	Yes	No
Instantly accessible visual design tools	Yes	No
Full cross-platform compatibility	Yes	No
Transaction processing	Yes	No
Multiuser-ready	Yes	No

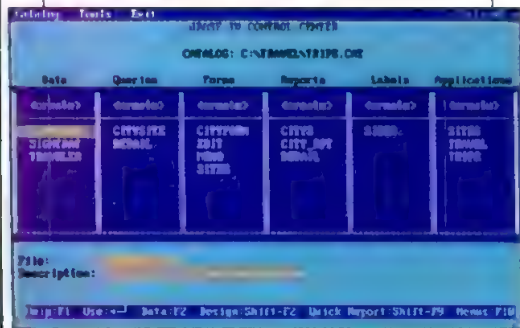
▲ dBASE meets a much wider range of needs than FoxPro.

The fastest dBASE ever

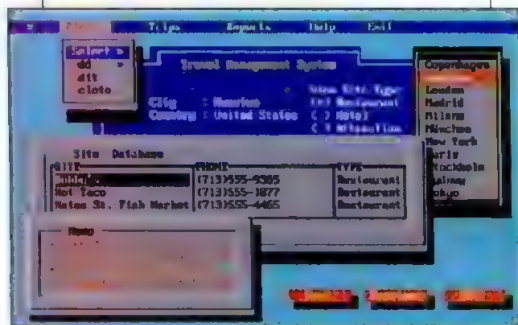
New version 2.0 is up to ten times faster than dBASE IV® v1.5 and dBASE III PLUS®! Whether you are browsing data, executing queries, or generating reports, dBASE gets your job done faster—even on networks.

dBASE makes it easy to do more

Powerful visual design tools give you the power to create database tables, queries, forms, and reports on the screen. You see what you are doing every step of the way. Query By Example gives you fast answers to your questions. A versatile Report Writer gives you the

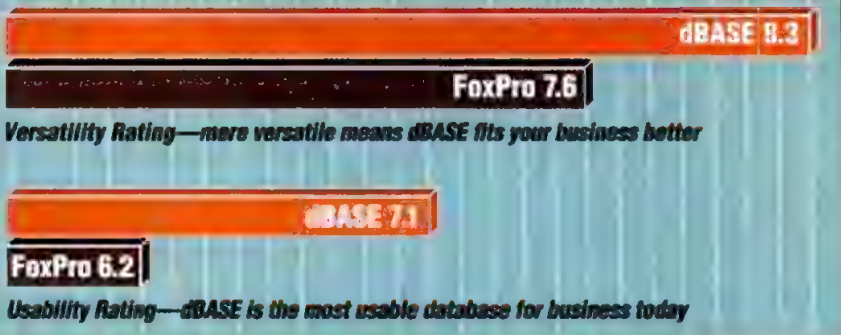


▲ From the dBASE Control Center, your data is only a mouse click or a keystroke away.



▲ Build sophisticated applications in record time.

More versatile . . . more usable



▲ NSTL found dBASE to be the favorite of both novice and experienced users alike in Overall Usability and Versatility.

widest choice of report styles available. And with the dBASE Control Center, it's easy to create or enhance your database application without programming. No wonder NSTL rated dBASE tops in versatility and usability!

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Antivirus Software

Watch Out for Viruses the Inexpensive Shareware Way

BY NEIL J. RUBENKING

If your computer's having hysterics and you suspect a virus, you need the most up-to-date antivirus software you can find. One way to acquire the latest antivirus solutions is to dial up CompuServe (or your favorite BBS) and download a shareware program like F-PROT, Version 2.07, from Frisk Software International; Integrity Master, Version 1.41b, from Stiller Research; or the Viruscan Suite of programs, Version 1.02 (SCAN, CLEAN, and VSHIELD), from McAfee Associates. All three have a variety of pricing and licensing arrangements for business, but for personal use the prices range from \$35 down to absolutely free.

F-PROT is a smooth, professional menu-driven package. From the Scan menu you select which disk(s) to scan, what method to use (Secure, Quick, or "Heuristic," which attempts to identify unknown viruses), what action to take (report, disinfect, or delete), what kinds of viruses to look for, and what files to scan. The scan is fast, and it's easy to print or save the resulting report. F-PROT's companion program, VIRSTOP, scans programs as you run them, aborting any that contain known viruses.

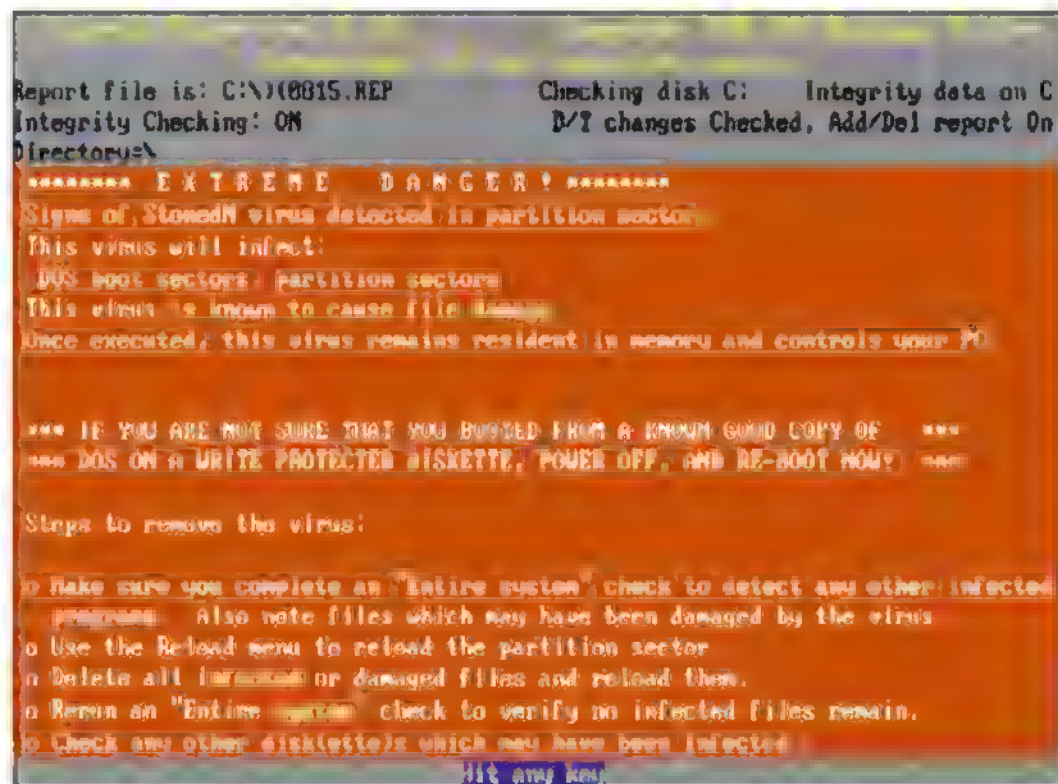
The Viruscan collection consists of three programs: SCAN, CLEAN, and VSHIELD, all command line utilities. A huge number of command line options let you configure each program, but a simple SCAN C: located all of our test viruses. SCAN returns a code for any virus it finds. You must note the code, reboot from a clean write-protected floppy disk, and pass that exact code to CLEAN in order to disinfect the virus.

If SCAN detects more than one virus type, you may have to reboot before running CLEAN for the next type, to avoid having CLEAN detect its own virus signatures in memory buffers. SCAN can optionally record integrity validation data. VSHIELD scans programs as you run them and refuses to load any that contain known viruses. Optionally, it can block programs that don't match their validation data or that don't have validation data.

file and restore from a clean backup.

Integrity Master's full-scale integrity tracking stores copies of the boot sector and partition table, plus integrity validation data that's encrypted using a unique algorithm selected during installation. If any of your files are damaged by a buggy program, a failing hard disk, a malicious coworker, or a virus, you'll know what happened.

All three products detected every boot sector and file-infect-



INTEGRITY MASTER: A warning screen includes removal instructions.

Integrity Master is much more than just an antivirus program—it's a complete system for data integrity and security. Its installation program includes a mini-tutorial on data integrity, along with a minor inquisition regarding your needs, which the program uses to set initial options. Integrity Master doesn't attempt to disinfect viruses. As its author points out, not all infected files can be restored, especially if infected with multiple viruses, and it's difficult to determine success. When Integrity Master discovers an infected file, it tells you to delete the

ing virus we threw at them (for information on our antivirus test procedures, see "Antivirus Software: Keeping Up Your Guard," *PC Magazine*, March 16, 1993). F-PROT and CLEAN disinfect all of these viruses with apparent success. The uncommon polymorphic "Dedicated" virus was harder to handle. F-PROT and CLEAN detected it but couldn't disinfect it; the Integrity Master program noted the infected files had changed but didn't always identify the virus by name.

F-PROT's VIRSTOP and McAfee's VSHIELD are both

virus-scanning TSRs. They trap every attempt to load a program and abort the attempt if the program contains a known virus. They can optionally trap attempts to copy infected programs or boot from an infected floppy disk. Both stopped every attempt to run an infected program except programs infected by the "Dedicated" virus. They did stop every attempt to boot from an infected floppy disk. None of the three products includes a TSR to monitor and intercept virus activity, because modern "tunneling" viruses easily evade this type of monitor.

Of the three, F-PROT has the best registration price—free for personal use, \$1 per copy per year for a business. It does a fine job of detecting, removing, and intercepting viruses. Integrity Master's \$35 registration gets you a 112-page manual and a system that will detect any changes to your files, not just viruses. If command line utilities suit your style, register SCAN, VSHIELD, or both (\$25 each), and pick up CLEAN later only if you need it. Fortunately, you don't have to decide right away. You can download all three packages, evaluate them, and then make your decision.

• Registration price: *F-PROT, Version 2.07, free for personal use; \$1 per copy per year for business use.* Requires: 384K RAM, DOS 2.1 or later. Available on CompuServe VIRUSFORUM Lib 6 as FPR207.ZIP.

Circle 433 on reader service card

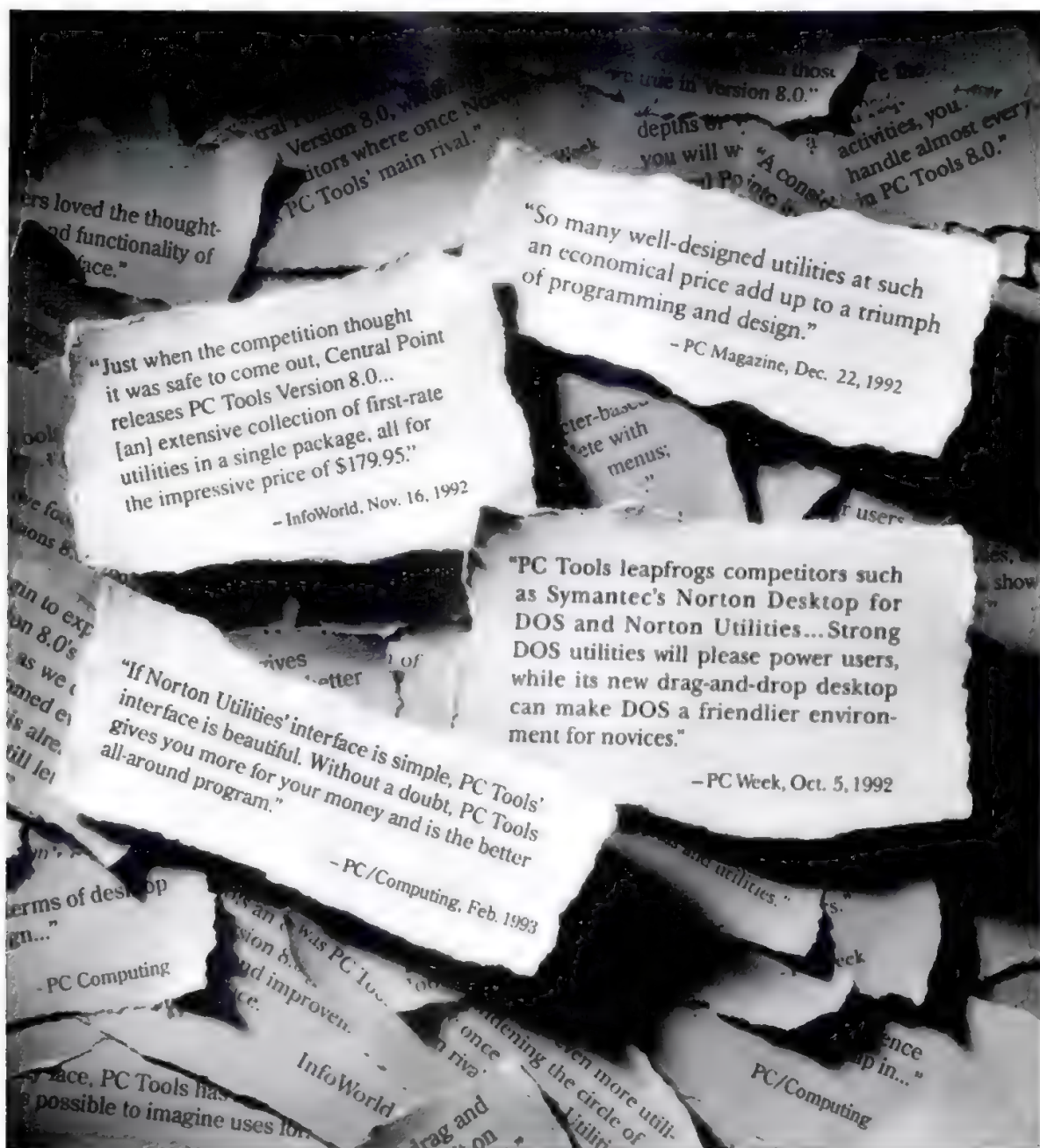
• Registration price: *Integrity Master, Version 1.41b, \$35.* Requires: 340K RAM, DOS 2.0 or later. Available on CompuServe IBMSYS Lib 3 as I-MAST.ZIP.

Circle 434 on reader service card

• Registration price: *Viruscan Suite, Version 1.02, SCAN, \$25; VSHIELD, \$25; CLEAN, \$35.* Requires: 320K RAM, DOS 3.1 or later. Available on CompuServe VIRUSFORUM Lib 1 as SCN102.ZIP, VSH102.ZIP, CLN102.ZIP.

Circle 427 on reader service card

We think PC Tools 8.0 will impress you.
Of course, you could get an 82nd opinion.



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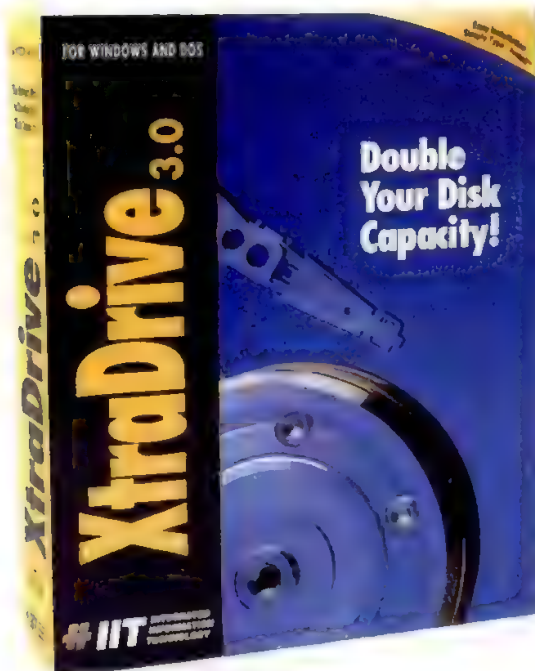
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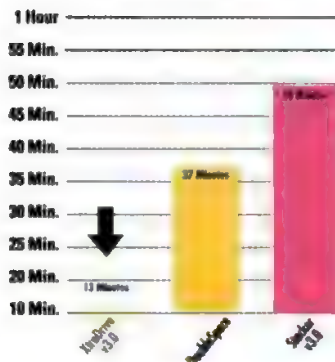
CIRCLE 079 ON READER SERVICE CARD

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*Testing performed on a 386DX-40 MHz, 116 MB IDE Quantum HD with 110MB's of data, 8MB RAM (70ns), AMI BIOS, Symphony Chipset.

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Act Now!

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CIRCLE 181 ON READER SERVICE CARD

New & Improved

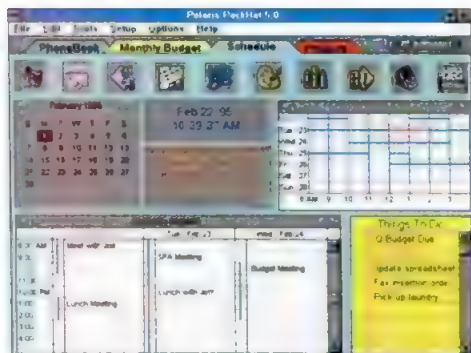
NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Brad Grimes

IMPROVED

PackRat 5.0 May Be the Only Windows App You See

Polaris Software's Microsoft Windows-based personal information manager, Pack Rat, has been upgraded again. Though it's never been able to do your laundry, PackRat could manage your time, your phone calls, your contacts, your documents, your money, and your projects. Now it's going to do all that better. Polaris's SmartStart installation provides a customized starter set of workspaces geared to your needs as you specify them during installation, and you can further customize the workspace folders by adding, editing, or removing tools or creating entirely new folders. Instant Options lets you access PackRat 5.0's object-oriented customization tools with the click of a mouse.



PackRat 5.0's folder approach to managing information is easy to understand and customize.

PackRat 5.0 integrates seamlessly with applications like Ami Pro, Word for Windows, WordPerfect for Windows, Excel, Eclipse FAX, WinFax PRO, cc:Mail, and Microsoft Mail. PackRat Basic design macros automate common PackRat and Windows operations for one-click access. The new version supports the Messaging Application Programming Interface (MAPI) and Vendor-Independent Messaging (VIM) as well as Object Linking and Embedding (OLE), making it a tool that can streamline your Windows desktop and essentially replace your Program Manager.

- List price: PackRat, Version 5.0, \$395. Polaris Software Inc., 17150 Via Del Campo, #307, San Diego, CA 92127; 800-722-5728, 619-674-6500; fax, 619-674-7316.

Circle 406 on reader service card

HOT PROSPECT



With Compaq DirectPlus You Can Order Over the Phone

Having introduced a low-cost line of PCs, cut the time between new offerings, and revamped its support policies, Compaq Computer Corp. has now decided to sell direct. Through the DirectPlus service, you can order select Deskpro I, ProLinea, and Contura systems over the phone. Prices of the desktop systems, including monitor, range from \$1,099 to \$2,299. Contura models range in price from \$1,675 to \$2,199.

In addition to PCs, Compaq will sell 34 different software titles. Three software bundles are available, including the Specialized Business Productivity bundle, which comes with Quattro Pro for Windows 1.0, WordPerfect for Windows 5.2, and Harvard Graphics for Windows 1.0 for \$499.

Systems also come in five bundled configurations like the \$1,675 Basic Plus bundle, which includes a 486-based ProLinea 4/25s with 4MB of RAM, a 120MB hard disk, an SVGA monitor, a 2,400-bps data/fax modem, Quicken for Windows, Calendar Creator Plus, After Dark, WinFax PRO for Windows, Microsoft Works for Windows, Microsoft Windows 3.1, DOS 5.0, and a mouse. Two new support policies offer optional services, including on-site setup and installation and remote diagnostic support.

- Compaq DirectPlus, 800-888-5858, 7:00 to 7:00, Monday through Friday, 8:00 A.M. to 12:00 noon, Saturday (central time).

Circle 405 on reader service card

NEW

Keydata Subnotebooks Feature Dual-Scan, Active-Matrix Color

Keydata International has introduced two new subnotebook PCs based on a 33-MHz 486SLC processor and weighing just 4 pounds (not including the weight of an optional external floppy disk drive). The Keynote Compacts include a monochrome dual-scan model and an active-matrix color dual-scan model, both with 4MB of RAM, an 80MB hard disk, a trackball, and one PCMCIA 2.0 slot for an optional memory or fax/modem card. The Color Keynote Compact's advanced color display not only provides the vibrant colors of active-matrix technology but also offers the crisp, clear picture that comes when the display's pixels are lit in two simultaneous sweeps.

- List price: Monochrome Keynote Compact, \$1,695; Color Keynote Compact, \$3,295. Keydata International Inc., 111 Corporate Blvd., S. Plainfield, NJ 07080; 800-486-7010, 908-755-0350; fax, 908-756-7359.

Circle 407 on reader service card

IMPROVED

Cardiff Improves Teleform's Character Recognition

Last year, **Cardiff Software** announced an upgrade to its data collection package, Teleform for Windows. Now Version 2.0, with its enhanced hand-print recognition, optical character recognition (OCR), and ability to fill in forms in advance, is shipping to end users. Advancements in hand-print recognition include support for alphanumeric mixed upper- and lowercase characters, and neural network software that provides faster, more accurate recognition of hand-printed data. When filling out forms, Teleform 2.0 can take information from databases and merge it into predefined forms for fax transmission. When the fax is returned, Teleform uses its hand-print recognition and OCR to update records automatically.

- List price: Teleform for Windows, Version 2.0, \$995. Cardiff Software Inc., 531 Stevens Ave., Building B, Solana Beach, CA 92075; 800-659-8755, 619-259-6430; fax, 619-259-6450.

Circle 408 on reader service card

New & Improved

NEW

Dell Offers Low-Cost Color Notebook, Next-Day Shipment

Dell Computer Corp.'s low-cost Dimension line now includes a passive-matrix color notebook dubbed the Dell Dimension NL25C. It's based on an Intel 25-MHz 386SL processor and comes with 2MB of RAM, a 64K cache, and either an 80MB, 120MB, or 200MB hard disk. The 6.6-pound notebook is driven by a nickel cadmium battery that is rated to last for up to 5 hours when the system's power-management features are in use. The 9-inch VGA display is capable of up to 256 colors and supports simultaneous external display for convenient use in presentations.



The Dell Dimension NL25C, a notebook PC, brings color in under \$2,000.

Dell also announced that the Dimension NL25C and its siblings the NL20 and NL25 are now available through its Quick-Ship program. If you place an order by noon, central time, the system will be ready for next-day shipment.

- List price: *Dell Dimension NL25C*, \$1,999. *Dell Computer Corp.*, 9505 Arboretum Blvd., Austin, TX 78759-7299; 800-289-3355, 512-338-4400; fax, 512-794-4238.

Circle 409 on reader service card

NEW

Epson Sells Memory Cards Through the Retail Channel

Epson America is making PCMCIA-standard memory cards available through retail channels. The new cards, which feature 512K, 1MB, or 2MB of static RAM, comply with PCMCIA levels 1.0 and 2.0, as well as JEIDA levels 4.0 and 4.1; therefore, you can use them with any notebook, tablet, or other device with PCMCIA- or JEIDA-compatible slots. Each card has two batteries. The main, replaceable battery has a rated life of one to three years, depending on the memory capacity and use, while a nonreplaceable, recharge-

BRIEFS

HARDWARE AND GADGETS

Mustek is shipping the Matador 256 for Windows (\$149), a 256-gray-scale scanner that comes bundled with Micrografx's PhotoMagic LE and Ocron's Perceive Personal OCR software. The scanner is Twain-compliant, so you can scan images directly into applications that support the Twain standard. 714-453-0110; fax, 714-453-1010.

Verbox Voice Systems has unveiled Listen for Windows (\$995), a speech interface for Windows that includes a coprocessor board with digital signal processing (DSP), a noise-canceling microphone, and hundreds of resident words that can be spoken individually or in combinations to control desktop menus, utilities, and common commands in most Windows applications. 908-225-5225; fax, 908-225-7764.

Aztec Labs has announced two new 16-bit stereo sound cards, the Business Audio Board (\$199) with a built-in power amplifier, and the Sound Galaxy NX Pro 16 (\$269), which can support the Sound Blaster Pro and Microsoft Windows Sound System at the same time it supports the Ad Lib, Disney Sound Source, and Covox Sound Thing. Both products use a Yamaha synthesizer chip and come with a wealth of software, such as Monologue for Windows, Voyetra AudioStation, and HSC Interactive animation software. 510-623-8988; fax, 510-623-8989.

Phoenix Graphics is shipping the VideoPak-1024 (\$649), a portable high-resolution adapter for Toshiba notebook PCs, providing accelerated video graphics and support for graphics resolutions up to 1,024-by-768 with 256 colors. It has resolution-switching software for Windows that reconfigures Windows drivers for LCD and high-resolution modes. 619-283-9375; fax, 619-528-8711.

VGA to TV Elite (\$399), from **Advanced Digital Systems**, is a combination hardware/software package that lets you display computer text and graphics on a TV set or record them on a VCR without

able backup battery lasts 10 minutes in the event you need to change the main battery and protect your data.

- List price: *Epson RAM cards*, \$179.99 (512K), \$249.99 (1MB), \$389.99 (2MB). *Epson America Inc.*, 20770 Madrona Ave., Torrance, CA 90509-2842; 800-922-8911, 310-782-0770.

Circle 410 on reader service card

NEW

Upgrade Kit from Samsung Delivers 1,200-dpi Printing

Add **Samsung Electronics America**'s new Image1200 upgrade kit to its Finalé 8000 laser printer and you get a desktop publishing printer with an effective resolution of 1,200 dots per inch. The upgrade kit comes with a 4MB SIMM; a Finalé 8000 high-resolution, halftone expansion board; and an extra-fine toner kit. It provides Samsung Resolution Technology, PostScript compatibility with 35 PostScript Level 1- and Level 3-compatible fonts, a TrueType rasterizer, and 14 bitmapped and 8 scalable fonts. The Finalé 8000/Image1200 combination delivers 256 shades of gray at 1,200 dpi and dynamically enhances the performance of the Intel 960 KA RISC processor, cutting down the production time of routine and complex, graphics printing jobs.

- List price: *Image1200 upgrade kit*, \$995; *Finalé 8000*, \$2,086. *Samsung Electronics America Inc.*, 105 Challenger Rd., Ridgefield Park, NJ 07660; 201-229-4000; fax, 201-229-4110.

Circle 411 on reader service card

IMPROVED

HiJaak PRO Boasts Enhanced Image Conversion and Capture

Inset Systems took user suggestions to heart and rewrote significant portions of its graphics conversion and capture utility, to come out with HiJaak PRO, Version 2.0. Due next month, HiJaak PRO features an improved user interface and increased speed in file loading, zooming, and scrolling. It supports new graphics file formats, including Photo CD, JPEG, and TIFF 6.0. By also supporting Aldus's Graphics Import Filter and WordPerfect for Windows' API, PageMaker and WP for Windows 5.2 users can transparently import over 70 graphics file formats.

HiJaak PRO 2.0 implements Twain technology for importing images from scanners or digital scanners. The new HiJaak Browser is an image cataloging feature that automatically creates thumbnail views of your image files,

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ware and Novell
compatible UPS
monitoring boards

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Back-UPS 250	LAN nodes, 386SX, 286, internet hardware, POS	\$169	\$139
Back-UPS 400	Desktop 386, 486 systems, 286 servers	\$249	\$229
Back-UPS 450	Tower 386, 486 systems, servers	\$329	\$279
Back-UPS 600	Heavily configured systems, CAD/CAM workstations	\$449	\$399
Back-UPS 900	Multiple systems, longer runtime applications		\$599
Back-UPS 1250	Multiple systems, LAN hubs, small minis, telecom equipment		\$799

**NEW
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CIRCLE 162 ON READER SERVICE CARD

r piled so much nter for so little.

With a personal laser printer under \$1,000, you normally have to give up one thing for another. Like speed. Or print quality. Or flexible paper handling.

Well, the new Epson® ActionLaser™ 1000 is way under \$1,000. And as you can see from the large stack on the left, we've piled more into it than any other printer in its price range.

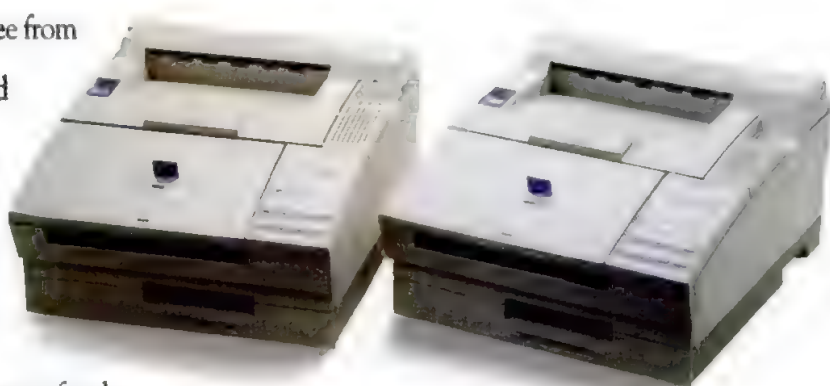
Like speed, for example. We clock in at 6 pages per minute, compared with a slow 4 pages per minute for the leading laser in the same price range.

Then there's print quality. Our blacks are blacker and our lines print finer, thanks to Epson's exclusive MicroArt Printing.

If you're really a stickler for sharpness, you can spend a little more (but still less than \$1,000!) for our ActionLaser 1500, with Epson's RITech resolution improvement technology. As well as 13 scalable fonts.

Add a 150-sheet paper tray that handles multiple paper sizes including envelopes, and you can see why Epson laser printers win industry award after award.

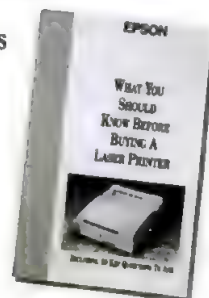
Now for the things you can't see. Our



ActionLasers have a two-year warranty instead of the typical one year. Plus the toll-free Epson Connection hotline to answer your questions.

Only Epson gives you so much, for so little. Even our booklet, "What You Should Know Before Buying a Laser Printer," is absolutely free. To send for it, call 800-289-3776.

EPSON

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New & Improved

whether they reside on your hard disk, on a CD-ROM drive, or on a network. Image files can also be organized in nested folders to group similar images. If you own HiJaak for Windows, you can upgrade to HiJaak PRO 2.0 for the cost of shipping and handling.

•List price: *HiJaak PRO, Version 2.0, \$169. Inset Systems Inc., 71 Commerce Dr., Brookfield, CT 06804-3405; 800-374-6738, 203-740-2400; fax, 203-775-5634.*

Circle 412 on reader service card

IMPROVED

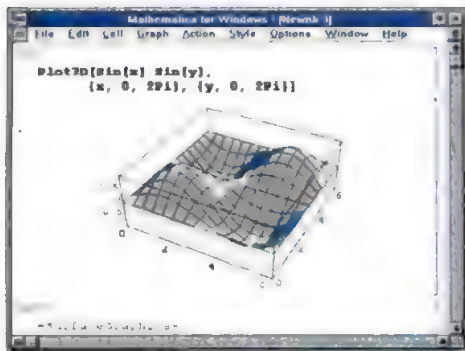
Wolfram Research Enhances Its Mathematical Software

Wolfram Research's Mathematica for Windows, Version 2.2, is more stable than previous versions and features significant enhancements to its computational and package functions. Equation solving has been improved with two new algorithms for working with symbolic matrices, and differential equation solving has been enhanced through improvements to the DSolve function, additions to the Calculus DSolve package, and inclusion of a new Calculus PDSolve package for symbolic solution of first order partial differential equations. Eleven new packages for such tasks as 3-D contour plotting, variational methods, elliptic integrals, and music and sound are also included.

The Windows interface has been made easier to use and customize. You can now toggle the display of the ruler bar, toolbar, and status bar. New commands let you find and replace text, merge and divide cells, and edit Notebook and default cell styles. The Graphics Settings dialog box now lets you specify the height and width of the default graphics size in pixels.

•List price: *Mathematica for Windows, Version 2.2, \$995. Wolfram Research Inc., P.O. Box 6059, Champaign, IL 61821; 217-398-0700; fax, 217-398-0747.*

Circle 413 on reader service card



Mathematica for Windows 2.2 has new packages for 3-D contour plotting.

BRIEFS

HARDWARE AND GADGETS

the need for an RGB converter, large monitor, or LCD panel. It supports VGA modes up to 640-by-480 with 16.7 million colors. 800-888-5244, 310-865-1432; fax, 310-809-6144.

Similar in function to VGA to TV Elite is **International Computers' VideoOut** (\$99), a combination plug-in card/software product that sends computer text and graphics to either a TV or a VCR. The software is a TSR that reprograms the registers on your video card to convert the signal to NTSC. 414-764-9000; fax, 414-281-3522.

PCubid Computer Technology has introduced the CPU Cooler (\$39.95), a combination custom heat sink and miniature fan that sits atop a 486 processor and keeps the CPU at a safe temperature. The Cooler is supplied with a 12-volt motor that connects to a hard disk cable. 918-338-1338.

No need to replace the battery that maintains voltage across your PC's CMOS when you have **Clovis Point's C-Life!** (\$25). The miniature unit plugs into a spare power source on the system's power supply and operates continuously. You'll never have a hard disk failure because you've lost the setup information in your CMOS. 802-767-9292

SOFTWARE

Symantec Corp. will now market Future Systems Solutions' Speedcache+, Version 4.0, under the Norton name (\$99). The program speeds up disk caching of hard disks, CD-ROM drives, and other removable media drives under both DOS and Windows. It supports cache sizes up to 23MB and works with popular disk compression and memory management utilities. Users of The Norton Utilities or The Norton Desktop can purchase Norton Speedcache+ 4.0 for \$19 until May 31. 800-441-7234, 408-252-3570; fax, 408-252-4694.

Lucid Corp. is shipping the Battery Boost Notebook Utility Pack (\$179.95), a collection of popular utilities for lap-

NEW

JetFax Turns HP LaserJet 4 Into Fax Machine

The new JetFax MIO card from **JetFax** turns your Hewlett-Packard LaserJet 4 into a network, personal, and plain-paper fax machine by plugging into the printer's MIO slot and saving the cost of a dedicated fax server. It supports almost any local area or peer-to-peer network, including LANtastic, LAN Manager, NetWare, and Windows for Workgroups. Like its sibling, JetFax II, JetFax MIO comes with DOS and Windows fax software for faxing directly from applications as easily as printing a file.

The Windows software lets you annotate and view all the pages of a fax before sending it out. A remote-printing capability provides fax resolution's of up to 600 dpi when faxes are sent between JetFax MIOs, and JetFax will store up to 15 pages for later printing. (A 60-page upgrade costs \$79; a 240-page upgrade is \$199.)

•List price: *JetFax MIO, \$399. JetFax Inc., 978 Hamilton Ct., Menlo Park, CA 94025-1430; 800-753-8329, 415-324-0600; fax, 415-326-6003.*

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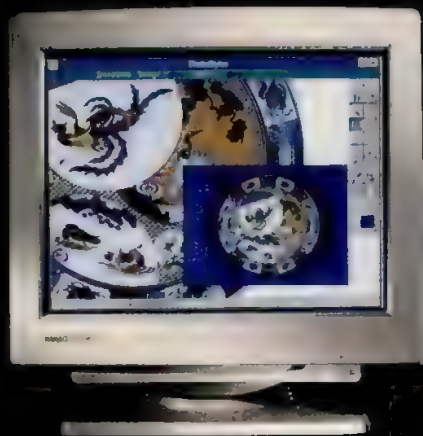
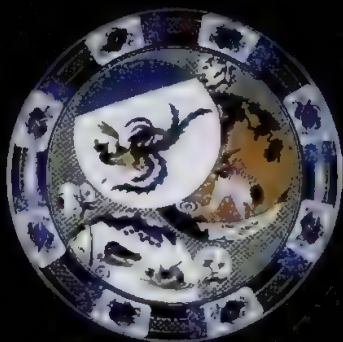
Online's Products Boost the Performance of CD-ROM Drives

Online Computer Systems is shipping two products that enhance the appeal of CD-ROM drives on standalone and networked PCs. Version 2.1 of the vendor's Opti-Net for DOS lets you share information on a networked CD-ROM drive with features like data prefetch, elevator seeking, and XMS caching at both the client and the server. With data prefetch, the CD-ROM server detects sequential read patterns, then predicts and prefetches data into the cache. Elevator seeking orders read requests for optimal throughput, reducing the total CD-ROM head motion required by a CD-ROM drive that services requests from multiple clients. By taking advantage of XMS caching, the software increases performance while decreasing network travel and the load on the CD-ROM server.

For standalone PCs, Online is offering Opti-CDcache, a software driver that uses XMS caching to speed up data retrieval from CD-ROM drives that service a single, personal system.

•List price: *Opti-Net for DOS, Version 2.1, \$795 for 8 users, \$1,495 for 100 users; Opti-CDcache, \$89. Online Computer Systems Inc., 20251 Century Blvd., Germantown, MD 20874; 800-922-9204, 301-428-3700; fax, 301-428-2903.*

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June 30, 1992
FlexScan F550i



March 16, 1993
Nanao FlexScan F340W

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New & Improved

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New Remote Control for Windows Supports All Video Modes

In the hot arena of remote control and file-transfer software, **Avalan Technology** is shipping a new network product, *Remotely Possible/LAN 1.0* for Windows, and an upgraded modem product, *Remotely Possible/Dial 2.1b* for Windows. Both offer true Windows remote control with full video translation (FVT), video panning, true color support, and support for all Windows video resolutions. FVT lets you connect two PCs that are running different video modes, and video panning lets you view an entire host screen even if it's running at a higher resolution than the viewer.

Both *Remotely Possible* products include basic features like a two-way chat mode and automatic callback, plus user-configurable reboot and inactivity timers. The user interface is easy to navigate, with icons that provide fast connections at the touch of a mouse button, and laptop users will be happy to know that cursor enhancement is retained over *Remotely Possible* connections. And like most remote-control programs today, *Remotely Possible* provides file-transfer capabilities with a variety of meters to monitor performance status.

The LAN version supports NetWare IPX networks and Windows for Workgroups, and the modem version supports high-speed modems up to 115,200 bps.

- List price: *Remotely Possible/LAN 1.0* for Windows, \$499 for unlimited concurrent users; *Remotely Possible/Dial 2.1b* for Windows, \$199. **Avalan Technology Inc.**, 116 Hopping Brook Park, Holliston, MA 01746; 800-441-2281, 508-429-6482; fax, 508-429-3179.

Circle 417 on reader service card

NEW

Panasonic Ships Low-Cost, Quiet Dot-Matrix Printer

Dot matrix printers used to rip through printing chores with the subtlety of a jackhammer.

Panasonic Communications & Systems Co. is hoping that if you buy its new 10.6-pound KX-P2023 for your home, you'll forget it's there. The 24-pin dot matrix printer is priced to suit a home user's budget, with a low noise rating of 46.5 dB. The KX-P2023 is the first in Panasonic's KX family to come with a utility disk that includes a Microsoft Windows 3.1 driver and a Command Reference Program, plus a user-friendly initial setup program that gives you access to all the

BRIEFS

SOFTWARE

top and notebook PC users. It comes with Lucid's own Battery Boost for power management; FastLynx 2.0 for file transfer; DoubleDensity for disk compression; UltraFont, a derivative of Laptop UltraVision, for screen enhancement; COP (Complete Owner Protection) for computer identification and security; and NoMouse for cursor enhancement. If you currently use Battery Boost, you can upgrade to the Utility Pack for \$79.95. 800-925-8243, 214-994-8100; fax, 214-994-8103

For designing and printing envelopes, **Envelope Manager Software** is offering DAZzle (\$39.95), a Windows utility that produces custom envelopes from any Windows application. Using telecommunications, DAZzle can check any address against the U.S. Postal Service's directory of addresses. The program supports bar coding and Windows fonts, and has the ability to compute postage for any class of mail, weight, and destination. 800-576-3279, 415-321-2640; fax, 415-321-0356

Add-in specialist **Intex Solutions** is shipping *Operations Manager* (\$495), an add-in to DOS and Windows spreadsheets that combines solutions for common manufacturing and operations applications. Categories of applications include forecasting, inventory management, production planning, scheduling, and quality control. 617-449-6222.

General Data Systems is shipping *In&Out Form* (\$299), a software product that lets you scan a letter or legal-size form into your PC and then define any area on the scanned form as a data entry field. After all the fields have been defined, data can then be entered and saved as records that can be copied, deleted, added, and updated. 800-967-0719, 818-249-7742; fax, 818-249-6217.

Micha Development Corp. has released *Full Armor 2.1* (\$99.95), a non-memory-resident software security utility that protects data in DOS and Microsoft Windows without slowing down system performance. 800-653-1783, 617-489-5854; fax, 617-489-5844

common printer functions while you are operating your PC, such as text enhancements, lines per inch, form length, micro line feed, margins, and super-quiet mode.

The KX-P2023 has three draft fonts (pica, elite, and micron) and four letter-quality fonts (Courier, Prestige, Bold PS, and Script). It quietly prints at a maximum burst speed of 240 characters per second (cps) in draft mode and 80 cps in LQ mode, and includes a 14K buffer capacity.

- List price: **Panasonic KX-P2023**, \$349.99. **Panasonic Communications & Systems Co.**, Two Panasonic Way, Secaucus, NJ 07094; 800-742-8086, 201-348-7000.

Circle 416 on reader service card

**Made to order:
The Z-400+ line
with local-bus
video from Zenith
Data Systems.**



IMPROVED

ZDS Upgrades Its Z-400 Line To Include Local-Bus Video

Zenith Data Systems' popular Z-400 series now includes the Z-400+ line of Intel 486-based PCs featuring VESA-compliant local-bus video with 512K of video RAM integrated on the motherboard. Systems come with a choice of three processors—a 25-MHz 486SX, a 33-MHz 486SX, or a 33-MHz 486DX; an 80MB, 170MB, 245MB, or 340MB IDE hard disk; and a choice of five monochrome and color monitors in display sizes of either 14 or 17 inches. A zero insertion force (ZIF) socket is provided for upgrading to a DX2/50 or DX2/66 OverDrive processor. (Pentium processors are not yet supported.) Each model comes with 4MB of RAM, expandable to 64MB on the motherboard. The Z-400+ represents ZDS's first line of assemble-to-order systems that lets you specify the processor, memory, hard disk, floppy disk drives, and peripherals.

- List price: **ZDS Z-400+**, \$1,039 to \$2,819. **Zenith Data Systems**, 2150 E. Lake Cook Rd., Buffalo Grove, IL 60089; 800-553-0331, 708-808-5000; fax, 800-472-7211.

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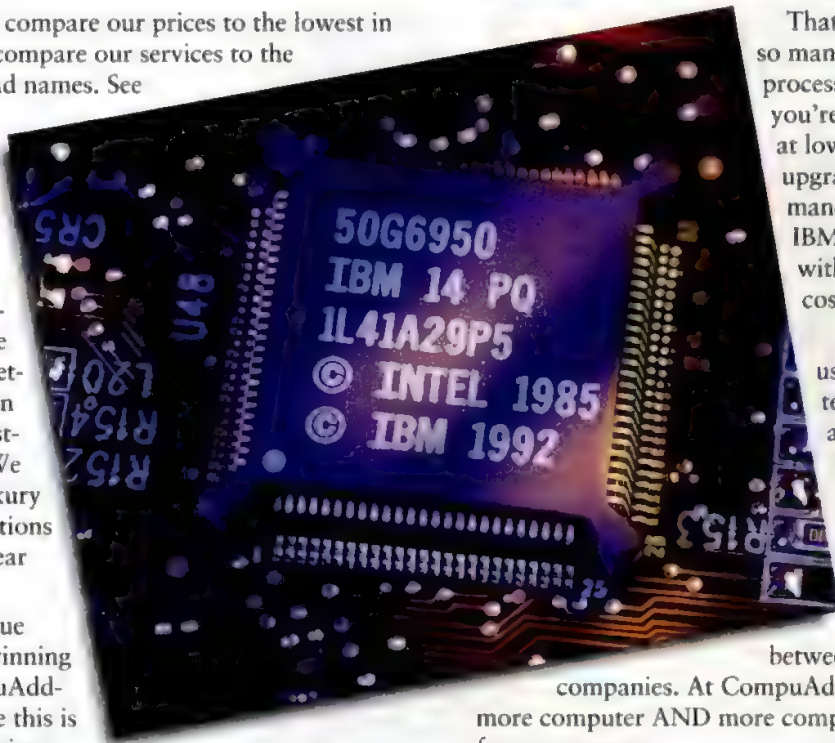
You're looking for the computer that's right for the job. Sometimes that means inexpensive, sometimes that means a computer that can expand if your needs do. And sometimes that involves meeting specific benchmarks.

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Read Only

REVIEWS OF THE LATEST BOOKS FOR THE PC USER

Edited by Carol Levin

The Hacker Crackdown

BY ANGELA GUNN

People fear things they don't understand, and fear may be a valid reaction to the hackers and phone freaks that threaten the computers of all good citizens. But after reading *The Hacker Crackdown*, Bruce Sterling's exposé of the world on the ragged edge of computing, concern for the half-baked technology laws on the U.S. books is a more intelligent response.

Sterling maps out the shadow world of computer criminals and the government agencies that try, with varying degrees of competence, to apprehend them. The book centers around Operation Sundevil, a 1990 tug-of-war between the government and a quasi-network of hackers in possession of Bell South documents hacked from a phone-



system computer. The government seized equipment from those accused of gaining illegal access to the documents. The book covers the seizures and trials, giving a well-rounded history of the hacker community and the new breed of "computer cops."

It's a remarkable read, full of history and subcultural information; the players are well drawn and the pace is absorbing, but certain statements beg for documentation. Sterling makes a high estimate (1 in 100) of the number of bulletin boards dealing in illegally gotten phone and credit cards and pauses only to swipe at the morals of the BBS community, as if leering to say he's giving them too much credit for honesty.

More disconcerting is Sterling's midbook change in attitude, when he switches his ap-

■ Cops, Whiz Kids, and Anarchists

"The Hacker Crackdown of 1990 was larger, better organized, more deliberate, and more resolute than any previous effort in the brave new world of computer crime. The U.S. Secret Service, private telephone security, and state and local law enforcement groups across the country all joined forces in a determined attempt to break the back of America's electronic underground. . . The crackdown, remarkable in itself, has created a melee of debate over electronic crime, punishment, freedom of the press, and issues of search and seizure. Politics has entered cyberspace. Where people go, politics follow."—*The Hacker Crackdown*

probation from those naughty hackers to the bullheaded and blustering corporations and legal systems that try to criminalize every piece of technology they can't control directly. The point is well taken but not well argued. Computer cops are indeed in a dreadful position, enforcing rules that don't exist about technology they don't understand. And much of the equipment the police are seizing is well beyond the reach of even those rare officials who know how to use it. The law appears first powerless, then dia-

bolical, then just blundering. And so it behaved in this case—but the author wrenches you between these points of view with a certain lack of grace.

Sterling's book is highly enjoyable and informative—a terrific read from an entertaining writer. But know that this isn't the last word on the subject.

• **The Hacker Crackdown: Law and Disorder on the Electronic Frontier**, by Bruce Sterling, \$23.00. Bantam Books, New York, NY 10103; 800-347-7828. ISBN: 0-553-08058-X.

Circle 462 on reader service card

The Politically Correct Eco-PC

BY SUSAN G. THOMAS

After years of sully Silicon Valley and lading landfills, computer companies are now investing in "green computing" products, environmentally sound hardware and software, and recycling incentives. *The Green PC: Making Choices That Make a Difference* by Steven Anzovin offers consumers advice on everything from hardware maintenance to healthful computing.

Common sense guides most

of the advice. It's no great revelation that using e-mail and printing on both sides of the page save paper, and most PC users know that printer companies offer incentives for recycling laser toner cartridges. The book is also repetitive. It gets a lot of mileage from topics such as reducing paper consumption.

Most interesting are some shocking statistics about PC waste, discussions of chip and



board production, and the government's initiatives for computer companies. Anzovin's descriptions of how toxic chemicals are used in PC manufacturing are informative and readable, and his discussion of the EPA's green computing incentives are helpful to consumers, who will want to make sure their purchases conform to the EPA's Energy Star Computer Program, a low-power consumption standard.

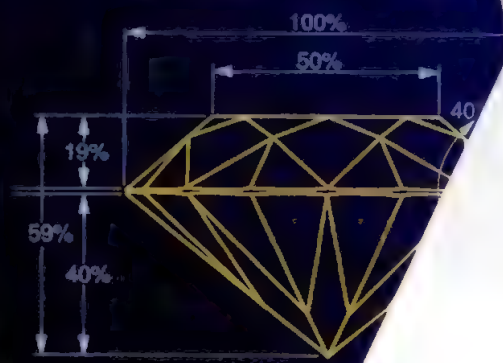
The Green PC is also a good reference. A list of resources,

consumer-advocacy groups, and environmentally correct companies ends each chapter.

If you want surprising facts about pollution or basic advice on how to clean up your act, *The Green PC* may be worth its weight in 75 percent post-consumer recycled paper. But if you're after concrete product recommendations, keep your green in your wallet.

• **The Green PC: Making Choices That Make a Difference**, by Steven Anzovin, \$9.95. Windcrest/McGraw-Hill, Blue Ridge Summit, PA 17294; 800-233-1128. ISBN: 0-8306-4311-7.

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Mitsubishi Electric Sales Canada, Inc., 4299 14th Avenue, Markham, Ontario L3R 0J2

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CIRCLE 136 ON READER SERVICE CARD

Toolkits

REVIEWS OF THE LATEST TOOLS FOR THE PC PROGRAMMER

Edited by Trudy Neuhaus

VBAssist Augments the Productivity of Your VB Development

BY BARRY SIMON

Have you ever discovered a feature and said to yourself, "If I had thought of that, I would have wanted it!"? Serious users of Microsoft's Visual Basic will have that experience many times with Sheridan Software's \$179 VBAssist, Version 2.0. And so, no doubt, will the product designers at Microsoft.

VBAssist is a set of tools that makes it easier to write Visual Basic applications. For example, one of VBAssist's Control Manipulation tools, Control Alignment, provides functions that let you align controls on a form, center them, evenly space them within a row or column, and make them the same size. Producing an attractive interface is now child's play.

However, once you create your ideal interface, it's too easy to accidentally move a control on a form when, for example, you click on a control to access its code window. So VBAssist provides a Control Lock mode which locks all the controls on a form in place. But Sheridan's implementation isn't restrictive: You can still change a control's properties and, if necessary, temporarily bypass the lock on a particular control.

Viewing and setting the tab order of controls on a form in VB is painful at best. You have to separately select each control

and then go to the properties list to view or set the tab number. With VBAssist, however, you just click on the Tab button and a number appears on each control—you can immediately see the order in which the controls will receive focus if a user uses the Tab key. Setting a new tab order is as simple as clicking on the controls in the order you want while in Tab mode.

Perhaps VBAssist's most impressive features, though, are those that enhance VB's property management. VBAssist supports the right mouse button as a Property Inspector. If you enable the right mouse button on a form or a control, a menu will appear that gives you instant access to Alignment and Tab Order controls, as well as an improved VBAssist property window. Right-click in a code window and you'll get a list of code items, such as DO/WHILE or FOR/NEXT. Select one of these and its text will be inserted into your code. This feature comes in handy when, for example, you need to create nested FOR loops.

VBAssist has also improved upon Visual Basic's Property window. For many controls, the VB Property window presents you with a list of properties. Un-

fortunately, it's a long list presented in alphabetical order. With VBAssist's property window, the Property Assistant, you can either use a long list or property subsets located on a button bar. Hence for a particular control, you can see, for example, just the color properties or just the font properties.

My favorite property enhancements, however, are VBAssist's tools for changing

scratch every time.

Version 2.0's Quick Access buttons make 20 common functions readily available. For instance, one button can show/hide VB's Properties and Project windows, while another can invoke color and picture setting dialogs. The Quick Access buttons also let you enable and disable an expanded button bar that gives you direct access to various VB menu choices such as all the FIND and Clipboard selections. Finally, VBAssist's Code Assistant is an MDI editor that replaces and supplements VB's free-floating windows. It lets you edit ASCII files and VB forms and modules from other projects and includes the Visual Clipboard and Code Librarian.

The Visual Clipboard provides an area where you can assemble text from multiple sources,

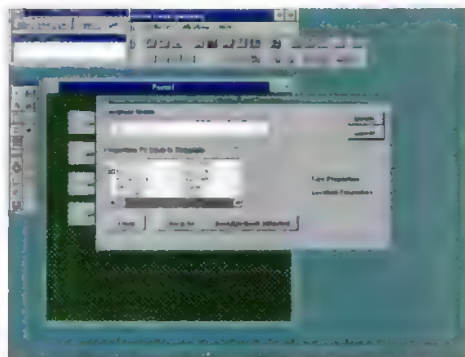
since it appends any text you copy to it to the text already there—unlike the Windows Clipboard, which replaces existing text with your new text. The Code Librarian lets you save code snippets you want to reuse, assign them keywords, and then search for them using the keywords. In addition, it comes with the Windows API calls organized by function.

If you thought writing programs couldn't get any easier, try VBAssist. You'll quickly see how VBAssist makes coding in VB even more productive. □

• VBAssist, Version 2.0

List price: \$179. Requires: Windows 3.1 and Visual Basic 2.0. Sheridan Software Systems Inc., 65 Maxess Rd., Melville, NY 11747; 516-753-0985.

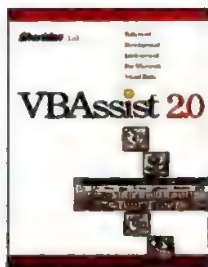
Circle 451 on reader service card



VBAssist offers two additional button bars. And its template facility lets you save a set of properties and apply them to a control at a later time.

and setting whole collections of properties in a single step. Using the Synchronize button, you can set the properties of a single button and then apply those same properties to other buttons on the same form or other forms within the project. In addition, you can save a set of properties to a VBAssist template and later apply that template to a control in a new project.

Think about the time this can save. For instance, do you ever have to use forms that don't have a system menu or minimize/maximize buttons? By using the Synchronize button you can save those defaults to a template that you name. Then the next time you need such a form, a few button clicks will set it up; you don't need to remember how to create it from



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What's more, HP's LaserJet 4Si MX printer is ready to handle whatever needs come down the

that adapts to multiple environments.



pike. More operating systems? No problem. As your network system continues to evolve, the capabilities of this printer are no longer just impressive. They're indispensable.

The HP LaserJet 4Si MX printer is loaded with features that define state-of-the-art. HP's enhanced PCL5 and genuine PostScript™ Level 2 software from Adobe™ come standard. Printer environments are saved while switching. Setup is a cinch with network software utilities and drivers included in the box. And, if you need any reassurance about trouble-free operation, you have it in our Simple Network Management Protocol (SNMP) support.

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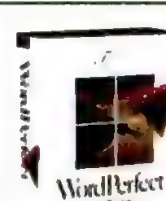
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Michael J. Miller

It's Alive!

Lots of computer users give funny names to their computers. But did you ever stop to think that your computer programs might actually be alive? That's a bit hard to swallow, although I admit that at times it has seemed as if Windows were out

to get me. What I'm really talking about is an emerging field of research known as *artificial life*, which deals with such things as defining what life is and creating computer programs and related equipment that meet that definition. It's all a bit esoteric, but it's fascinating to think through the implications—and it might have more practical applications than you can imagine.

The concept of modeling or simulating life on a computer is an old one. Even 15 or 20 years ago, I remember playing with Conway's Life, a version of a life simulator originally created by John Conway at the University of Cambridge. I remember seeing it on larger systems years ago, and later on the first PCs. You probably remember Life: little cells in a checkerboard that turn on and off (black and white dots) depending upon the number of black dots around them, simulating the way that microorganisms grow and decay based on exposure to the elements and the presence of enough food. It was simple, but it was fascinating to watch.

I had mostly forgotten Conway's Life until I saw the most amazing demonstration at the PC Forum conference in Phoenix. On the surface, it sounds about as boring as a software demonstration can be: a university professor with an overhead projector showing assembly code and talking about what each line of code does. Boring? Hardly.

The professor was Thomas Ray, a University of Delaware biologist, and what made his program unique was that it did lots of unexpected things. Professor Ray started out by creating a program with 80 instructions of assembly code that lived in computer memory, consumed CPU cycles, made copies of itself, and eventually moved up in a queue until it was removed. In other words, the program lived,

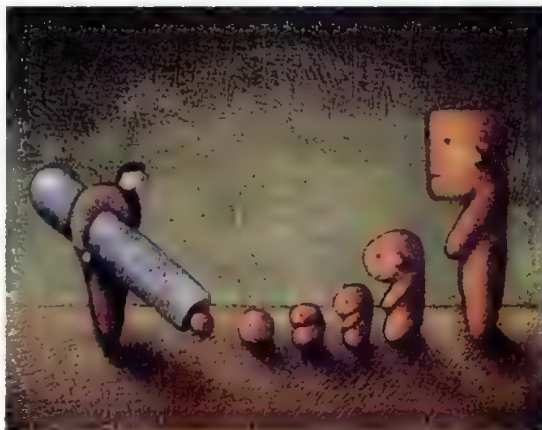
ate, reproduced, aged, and died.

What surprised Ray was what happened when he started running his simulation. The assembly programs ("creatures"?) grabbed memory and copied themselves into memory, thus reproducing. But little changes affected the size of the programs and how they worked—essentially the programs evolved. Soon Ray saw mutations that had only 79 instructions. These were eventually replaced by ones with fewer instructions (shorter versions required fewer CPU cycles to reproduce). Then all sorts of lifelike behavior showed up. He found parasites, 45-instruction organisms that used part of the code of other creatures ("hosts") to reproduce. These parasites proliferated for a while but were ultimately defeated by "immunized hosts." Later, hyper-parasites appeared. Then creatures that cooperated with one another, sharing the code for reproduction. Then cheaters, which could reproduce in only 27 instructions by taking advantage of the cooperative environment.

This demo led me to read Steven Levy's wonderful *Artificial Life* (Pantheon Books, 1992), the most engrossing book on technology I've read all year. Levy, who wrote the earlier *Hackers*, devotes his book to ques-

tions of artificial life, and to the stories of the people who have worked at defining life and how silicon-based life might work. It may sound like very theoretical work, but it turns out to have some surprisingly practical results. Levy takes us through the evolution of artificial life from a mathematical theory to today's applications to the potential for artificial life in the future. Although some of it seems a bit like science fiction, the book is always interesting and always thought-provoking.

In addition to Ray's



If code can eat, reproduce, age, and die, then can it also be alive? Artificial life researchers wonder.

Michael J. Miller

story, Levy introduces us to a cast of characters whose unique outlook on life leads them to some unusual insights into what life is and how it might be created *in silico*. These *a-life* researchers date back to John von Neumann and his theory of cellular automata (CAs), self-replicating machines that could be defined in mathematical terms. Conway's Life is the first popular CA. Stephen Wolfram (later the founder of Mathematica) creates one-dimensional CAs. MIT's John Holland comes up with the theory of genetic algorithms that evolve and optimize themselves. Danny Hillis's need for parallel processing, which more closely follows his view of the way life works, leads him to create The Connection Machine and Thinking Machines. Others use these theories to create simulated creatures and plants, and in applications ranging from computer viruses to graphics simulation to robotics.

I was particularly intrigued by the theories of Christopher Langton, the *a-life* re-

searcher who came up with the essential notion that CAs—and perhaps life itself—work in a bottoms-up fashion, controlling small actions that, when taken together, create a recognizable pattern of behavior. It's a very different approach from that taken in traditional artificial intelligence work, which tends to start with the big picture in mind and work down.

This different way of looking at life, and at software, is not currently the mainstream approach. But of course different ways of looking at the world usually take a while to get accepted—even if they offer benefits.

A similar message comes through in another recent book on a radical idea that has lots of implications for programming. *Fuzzy Logic* (Simon & Schuster, 1993), written by Daniel McNeill and *Fire in the Valley* author Paul Freiberger, traces the story of Lotfi Zadeh, a professor at the University of California at Berkeley, and his development of the theory of fuzzy logic. McNeill and Freiberger show the mathematical foundations of fuzzy logic and the kinds of applications that can be built with it. Fuzzy logic is based on the idea that most things in life are not completely certain. Many statements are neither completely true nor completely

false, but instead have different degrees of truthfulness. Things are not black and white, but shades of gray.

Zadeh pioneered this field 25 years ago, yet his work was largely ignored by American companies and by computer companies immersed in a system of ones and zeros, on and offs. However, his work was accepted by Japanese companies and is today being used in a wide variety of products. A Japanese subway system is completely managed by fuzzy-logic controllers. Fuzzy logic is a key component in products ranging from image stabilizers for camcorders to automatic focusing systems on cameras to anti-lock braking systems on cars. Only recently, McNeill and Freiberger argue, have American companies begun to see the benefits.

Today, both fuzzy logic and artificial life are really just beginning to find their way into commercial applications. Both have been hampered because they sound strange and don't seem practical, yet they may turn out to let us create programs and applications we never even dreamed of before. Fuzzy logic today, artificial life tomorrow—it all sounds less clear, less predictable, less logical than we expect computers to be. But maybe, it's a bit more like real life. □

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Cross-platform E-Mail, March 1993

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Network Computing's Certified Interoperable
Application Award, December 1992

•

Network World's Enterprise
Technology Award, December 1992

•

Software Digest's Highest Overall Evaluation,
8.7 Rating, 1992

•

MacUser Editors' Choice Award, 1992

•

MacWEEK 1992 Editors' Choice
Diamond Award, December 1992

•

UNIX World's Best Product of the Year for
1992, January 1993

MICROSOFT MAIL
Awards (1992-1993)

PC Magazine Editor's Choice Award
October 27, 1992

In the e-mail arena, this is what they call running up the score.

With over three million users, Lotus® cc:Mail® is overwhelmingly the e-mail of choice. In reality, there's no competition.

According to independent reviewers, cc:Mail is the fastest e-mail to learn, the easiest to use, and the smoothest to administrate.

cc:Mail's open architecture means it runs virtually anywhere on anything. Unlike other e-mail products, cc:Mail works with whatever software and hardware you have on board. Across any combination of Macs®, DOS, Windows™, OS/2®, UNIX®. Across LANs, WANs, public or private e-mail forums or unique operating systems. And cc:Mail always lets you work

in the environment you're used to.

Unlike Microsoft® Mail, cc:Mail is built for scalability. It maintains peak performance whether you connect 5 or 500,000 users.

Now that you know the score, it's time to make your call. Just dial **1-800-448-2500** for a free demo disk. And ask for the version of your choice: Macintosh®, Windows, DOS or UNIX.

And see how cc:Mail can put its points in your favor.

Lotus cc:Mail

SOFTWARE

Product Media Price

Spreadsheets

- ☐ Lotus 1-2-3 Windows 1.1 F5 \$ 315
Item #58836-16
- ☐ Lotus 1-2-3 Windows 1.1 F3 \$ 315
Item #61837-16
- ☐ Lotus 1-2-3 Windows 1.1 Upgrade F3 \$ 99
Item #54832-16
- ☐ Microsoft Excel for Windows 4.0 F3 \$ 299
Item #53253-16 (5.25 available)
- ☐ Microsoft Excel for Windows 4.0-Upgrade F3 \$ 119
Item #44625 (5.25 available)
- ☐ Lotus 1-2-3 2.4 F3 \$ 335
Item #67606-16
- ☐ Lotus 1-2-3 2.4 F5 \$ 335
Item #69601-16



\$99 Lotus 1-2-3 Upgrade

Word Processing

- ☐ WordPerfect 5.2 for Windows F3 \$ 275
Item #77919-19 (5.25 available)
- ☐ WordPerfect 5.2 for Windows-Upgrade F3 \$ 79
Item #57683-19 (5.25 available)
- ☐ Microsoft Word for Windows 2.0b F3 \$ 299
Item #64932-19 (5.25 available)
- ☐ Microsoft Word for Windows 2.0b-Upgrade F3 \$ 119
Item #62910-02 (5.25 available)

Product Media Price

Word Processing Can't

- ☐ Lotus Ami Pro 3.0 Dual \$ 249
Item #55236-19
- ☐ Lotus Ami Pro 3.0 Upgrade Dual \$ 99
Item #32259-19

Database

- ☐ Borland Paradox 4.0 F3 \$ 499
Item #63329-08
- ☐ Borland Paradox 4.0 F5 \$ 499
Item #63325-08
- ☐ Borland Paradox 4.0 Upgrade F3 \$ 185
Item #89829-08
- ☐ Borland Paradox 4.0 Upgrade F5 \$ 185
Item #91828-08
- ☐ DataEase Express for Windows F3 \$ 145
Item #85902-11
- ☐ Symantec Q&A 4.0 F3 \$ 249
Item #95743-13
- ☐ Symantec Q&A 4.0 F5 \$ 249
Item #17461-13

Presentations/Graphics

- ☐ Lotus Freelance Graphics for Windows F3 \$ 339
Item #29190-10 (5.25 available)
- ☐ Lotus Freelance Graphics for Windows-Upgrade F3 \$ 99
Item #00802-10 (5.25 available)
- ☐ Harvard Graphics for Windows 1.01 F3 \$ 349
Item #37744-10
- ☐ Harvard Graphics for Windows 1.01 F5 \$ 349
Item #89734-10
- ☐ Microsoft PowerPoint 3.0 F3 \$ 299
Item #12531-03
- ☐ Microsoft PowerPoint 3.0 F5 \$ 299
Item #82528-03
- ☐ Aldus Persuasion 2.1 F3 \$ 315
Item #77993-03
- ☐ Aldus Persuasion 2.1 F5 \$ 315
Item #83997-03
- ☐ Spinnaker PFS: Publisher for Windows F3 \$ 89
Item #38927-04

Product Media Price

Integrated

- ☐ Lotus SmartSuite F3 \$ 459
Item #71818-13
- ☐ Lotus SmartSuite F5 \$ 459
Item #73818-13
- ☐ Microsoft Office 3.0 F3 \$ 459
Item #36837-13
- ☐ Microsoft Office 3.0 F5 \$ 459
Item #49836-13
- ☐ Spinnaker PFS: WindowWorks 2.0 F3 \$ 75
Item #40941-13

General

- ☐ Chipsoft TurboTax for Windows Headstart Dual \$ 47
Item #73918-02
- ☐ Chipsoft TurboTax for DOS Headstart Dual \$ 47
Item #00635-02
- ☐ Intuit Quicken 6.0 Dual \$ 39
Item #79785-02
- ☐ Intuit Quicken for Windows 2.0 Dual \$ 29
Item #45870-02
- ☐ Intuit Quickbooks Dual \$ 89
Item #38392-02
- ☐ IBM OS/2 2.0 F5 \$ 139
Item #23449-17
- ☐ IBM OS/2 2.0 F3 \$ 139
Item #26442-17
- ☐ Symantec Norton Desktop for Windows 2.0 F3 \$ 109
Item #88164-11

Product Media Price

General Can't

- ☐ Symantec Norton Desktop for Windows 2.0 F5 \$ 109
Item #63129-11
- ☐ Quarterdeck QEMM 386 F3 \$ 59
Item #45010-17
- ☐ Quarterdeck QEMM 386 F5 \$ 59
Item #42019-17

PERIPHERALS AND ACCESSORIES

Multimedia

- ☐ Creative Labs Multimedia Upgrade Kit Int \$ 549
Item #30738-25
- ☐ Creative Labs Sound Blaster Pro Int \$ 189
Item #61991-54
- ☐ MediaVision Pro 16 Multimedia System Int \$ 899
Item #23507-54
- ☐ MediaVision Multimedia Upgrade Kit Plus Int \$ 735
Item #38504-54
- ☐ MediaVision Fusion 16 Multimedia Upgrade Kit Int \$ 499
Item #88934-25
- ☐ MediaVision Pro Audio Spectrum 16 Int \$ 199
Item #01507-54



\$239

PFS Printer Bundle: Item PFSPRN

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magazines for bargains.

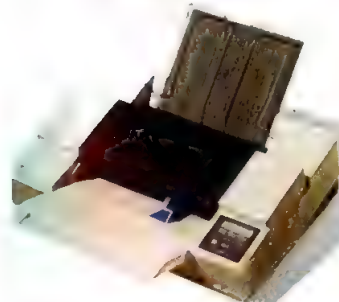
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Product	Media	Price
---------	-------	-------

Modems

- | | | |
|---|-----|--------|
| Cardinal Technologies 2400 w/Prodigy Kit Item #000666-41 | Int | \$ 39 |
| Practical Peripherals 2400 SA 9600Fax Item #55492-41 | Ext | \$ 109 |
| Practical Peripherals 9600 SA w/QuickLink II Item #17710-41 | Ext | \$ 305 |
| Hayes Optima 96/Smartcard EZ .32/.42BIS Item #60063-41 | Ext | \$ 349 |
| Cardinal MB14400 V.32 w/Turbofax V.42 Item #40355-41 | Ext | \$ 309 |



Lexmark Model 4079 Color Jet Printer

Input Devices

- | | | |
|--|----|--------|
| Logitech Mouseman Cordless Serial PS/2 Item #62063-35 | | \$ 87 |
| Logitech Mouseman Serial PS/2 RH Item #75010-35 | | \$ 67 |
| Microsoft Mouse-Bus Item #81453-35 | | \$ 89 |
| Microsoft BallPoint Mouse w/Windows 3.1 Item #55034-35 | F3 | \$ 149 |
| Logitech Scanman Model 256 Item #46485-53 | | \$ 263 |
| The Complete PC Complete Page Scanner w/OCR Item #41725-53 | | \$ 549 |

\$189 Sound Blaster Pro

Monitors

- | | |
|---|----------|
| NEC Multisync 3FGX Item #55195-23 | \$ 689 |
| NEC Multisync 4FG Item #75319-23 | \$ 799 |
| Radius PrecisionColor Display 19 Item #89497-23 | \$ 2,229 |
| Dell UltraScan 14C Item #320-3364 | \$ 449 |
| Dell UltraScan 15FS Item #320-3369 | \$ 549 |

Printers

- | | |
|--|----------|
| IBM/Lexmark Personal Printer II 9Pin 80Col Item #99025-27 | \$ 349 |
| IBM/Lexmark Personal Printer II 24Pin 80Col Item #87025-27 | \$ 349 |
| Epson AP-3250 Item #330-1482 | \$ 205 |
| Canon BJ-10 Ink Jet Item #72069-28 | \$ 329 |
| IBM/Lexmark Color Jetprinter 4079 II Item #12993-28 | \$ 2,749 |
| IBM/Lexmark 4070 LJ Item #79832-28 | \$ 375 |
| Epson EPL-8000 Item #330-3347 | \$ 1,159 |

Printers Can't

- | | |
|---|----------|
| IBM/Lexmark 4019 Laser Printer Item #79641-37 | \$ 849 |
| Genicom Model 7170 Item #12844-37 | \$ 3,215 |
| Okidata OL400P LED Page Printer Item #70695-37 | \$ 649 |
| Texas Instruments Microlaser Basic Item #13399-37 | \$ 899 |
| Texas Instruments Microlaser PS17 Item #12814-37 | \$ 1,215 |

Storage

- | | | |
|---|-----|--------|
| Quantum Prodrive ELS 85MB IDE Item #03731-34 | Int | \$ 215 |
| Quantum Prodrive ELS 127MB IDE Item #09734-34 | Int | \$ 289 |
| Quantum Prodrive ELS 170MB IDE Item #16736-34 | Int | \$ 325 |
| Conner Soft-Stor 3170 Item #76828-34 | Int | \$ 565 |
| Colorado Jumbo 250 DJ-20 Item #88977-26 | Int | \$ 269 |

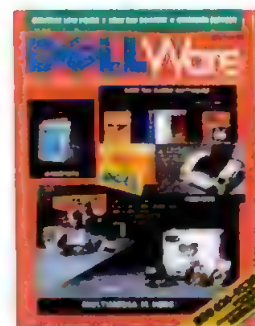
Product	Media	Price
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Storage Can't

- | | | |
|--|-----|--------|
| Imomega Tape 250 Insider Halfheight Item #35848-34 | Int | \$ 249 |
|--|-----|--------|

Networking

- | | | |
|---|------|--------|
| Artisoft Lantastic Windows Utility 4.1 Item #20664-36 | Dual | \$ 179 |
| Artisoft Lantastic Starter Kit 4.1 Item #89634-36 | Dual | \$ 489 |
| Novell Network Lite 1.1 Item #02829-36 | F5 | \$ 59 |
| Novell Network Lite 1.1 Item #01827-36 | F3 | \$ 59 |
| Windows for Workgroups Item #13151-17 | F5 | \$ 159 |
| Windows for Workgroups Item #13166-17 | F3 | \$ 159 |
| SMC Ethercard +Elite 16 Combo Item #23477-36 | Int | \$ 198 |
| SMC Ethercard +Elite 16T Int Item #11544-36 | Int | \$ 145 |
| IBM Token Ring 16/4 Item #89733-36 | Int | \$ 549 |



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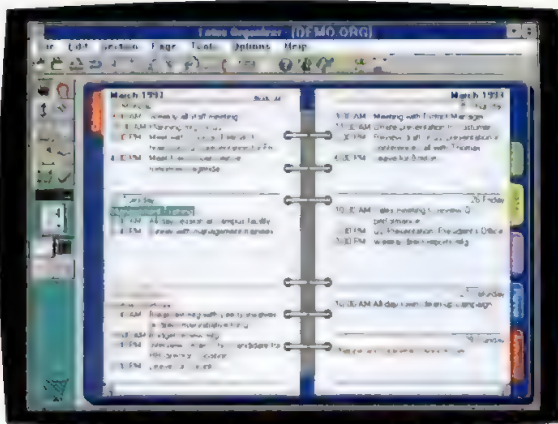
To order something from above (or to ask for a free catalog featuring the complete DellWare selection), simply phone toll-free. And forget about those other guys.

Whatever their name is.

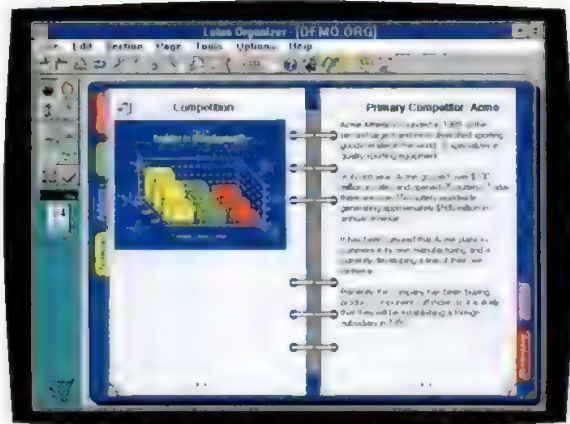
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800-247-2063

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SAT, 10AM-3PM CT SUN

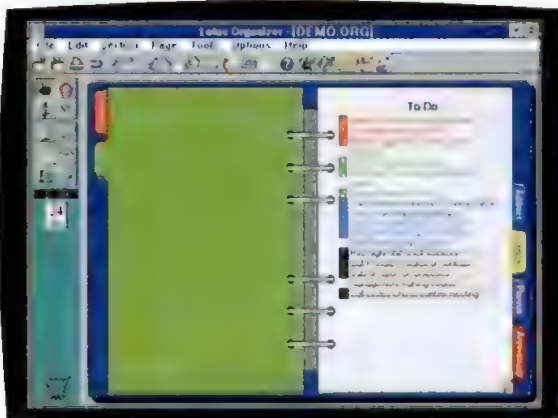


With Organizer, you can change the format of your calendar as you work: view it by day, by week, or even two weeks.

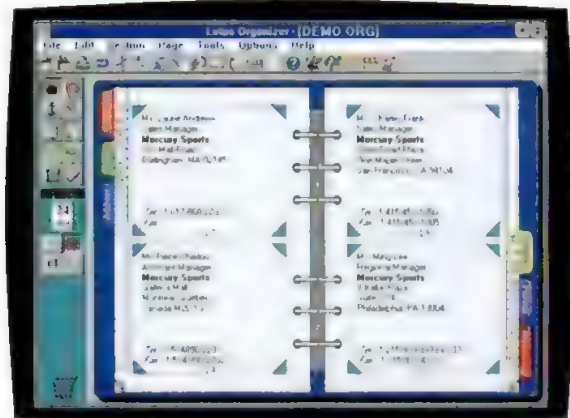


In the Notepad section, you can make free-form notes, import files or create a dynamic link to other Windows™ applications.

So, what does your day look like?



The To Do section lets you prioritize tasks as you enter them and view entries by due date.



Sort your address book in any of four formats: name, company, zip code and type of record. An Auto Dialer lets you simply drag and drop to dial a number through your modem.

If you're like most business people, it's not a pretty picture.

Unless of course, you've chosen to use Lotus® Organizer.™

As an on-screen calendar, to-do list, yearly planner, address book, notepad and anniversary reminder, Lotus Organizer could very well bring the order and efficiency you demand in your life. (Not to mention the sanity.)

Like a traditional planner, it works in familiar ways with named tabs for each section and pages that actually turn. But unlike any traditional planner, it allows you to do so many things you've never been able to. Like link entries stored in different sections, virtually any way you want. Plus, you can customize Organizer by renaming tabs, changing colors, and creating sections as you need to.

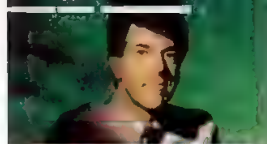
To remind you of an upcoming commitment, Organizer sounds an alarm at a pre-set time. It can also schedule your meetings, carry overdue tasks forward from day to day and, of course, print pages in formats to fit popular manual organizers.

So if you'd like to increase your productivity, efficiency and control over your daily business life, call Lotus at **1-800-872-3387, ext. 8489**. Or take a little time and visit your Lotus Authorized Reseller.

How's this afternoon look?



Lotus Organizer



Bill Machrone

Things That Work

The recurrent theme in this business is smaller, faster, cheaper. Except for software, which gets bigger, slower, and costs the same. My briefcase is crammed with products of the S-F-C persuasion. My trusty Gateway Nomad 486 laptop has logged

enough frequent flyer miles to earn it and a cybernetic companion first-class tickets anywhere in the world. It's still too heavy by a pound or so; I can hardly wait for the next generation. The battery life is great, though, and aside from an annoying habit of turning on its low-battery light after there is insufficient power to spin up the hard disk and save the file I'm working on, I have no complaints. Even then, I've been able to put the machine into suspend mode and save the contents of memory until I could get to a charger. Except once. But that's another story.

The object next to my laptop could be mistaken for a small black leather evening bag were it not for the "Practical Peripherals" logo stamped on it in gold. Inside are a modem, a couple of cables, a power cube, and a battery pack. In a world where every strange food tastes like chicken and every compact electronic object is smaller than a cigarette pack (Remember cigarettes? We need a new analogy.), this modem actually fits the description. It crams the state of the art in communications technology into its diminutive black case: 14,400-bps communications, with all the latest vee-dots and bisses. The little pup even talks to faxes at 14.4 and comes with an assortment of software—as if you didn't have enough stuff on your disk. Actually, the fax software, Quick Link II, is pretty good. The modem, called PM14400FX, can run for a couple of hours on four AA batteries, if the outlet in your hotel room is under the bed and the bed is bolted to the wall.

In an age when people would rather play handball with sea urchins than set up asynchronous serial communications equipment, this modem is a blast. It has on-line help in

ROM, which you can peruse via your terminal program. You can query link statistics and the last connection made, for diagnostic purposes or plain old curiosity. It'll even parse phone numbers (1-800-OK-MODEM) and pause for calling-card prompts (bong!). It's done well in our testing at ZD Labs and even better in the real world. At a computeroid gathering in the Arizona Biltmore recently, I was one of the few who could punch a 9,600-bps signal through the creaky old phone lines. Oh, and it has a lifetime warranty and a street price in the low-\$300 range. What are you waiting for?

SMARTICONS

The only way for software to avoid the bigger/slower phenomenon is to break out into a new category. That way it can't be compared with anything else. The day of the intelligent drawing program is upon us, most vividly embodied in a Windows package called Visio. My kids are often at the two machines in our den, redesigning their rooms, creating fantasy lands that could only exist in their imaginations and on Visio's screens, and generally having a ball. I use it too, when they'll let me.

Visio comes with a set of icons for drawing everyday things such as walls, doors, windows, patio furniture, organization chart boxes, desks, and chairs. You can buy add-on packs to draw everything else from landscaping items to whales and dinosaurs. To draw, you simply drag the icon from its menu area to the drawing. Not all the icons qualify as smart, but the ones that do are quite clever. For instance, you drag a dining room table icon into a room. You don't like the orientation, so you grab a handle and drag it into a new shape. The chairs magically rear-



Fortunately, the personal computer industry hasn't yet discovered entropy.

Hassle-Free Printer Sharing For Your Local Area Network

Use JetLAN to share your printer with
all other network print servers—no print server!

Simply plug **JetLAN** into your printer and you'll be up and running in less than five minutes. There's no need to shut down the network for installation and your Novell software is all you need.

Easiest Installation

JetLAN sets up fast because there are no mandatory file-server assignments. (In fact, **JetLAN**'s peer-to-peer capabilities let you print even when the file server is down.) **JetLAN** supports up to 40 print queues on up to 16 file servers.

Increase Printing Speed Up To Five Times

Data is transferred at up to 150 K-byte/sec.

Plug **JetLAN**

into an HP LaserJet printer and print a typical graphic file in less than 4 seconds.

JetLAN outpaces ordinary network printing, receiving whole blocks of data at network

speeds and feeding them directly to the print controller.

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Configure **JetLAN** from any supervisor workstation. Freely choose between NetWare's Pserver or RPrinter. **JetLAN**'s diagnostic LEDs and detailed on-screen status displays always give you a commanding view of your printing operations.

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Whether you're on a EtherNet, Token Ring, or NetWare ARCnet LAN-ASP has the print server solution for you. Get more productivity out of small office workgroups and big departmental LANs, dot-matrix and laser printers. Locate the printer where the people use it.

Since 1987, people have relied on ASP for reliable, *hassle-free* printer-sharing. We stand behind our products.

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PC
EDITORS
CHOICE

Bill Machrone

range themselves around the table. It's not smart enough to add new chairs if you elongate the table, but it's no trouble to duplicate a couple of chairs. All in all, an entertaining and useful package.

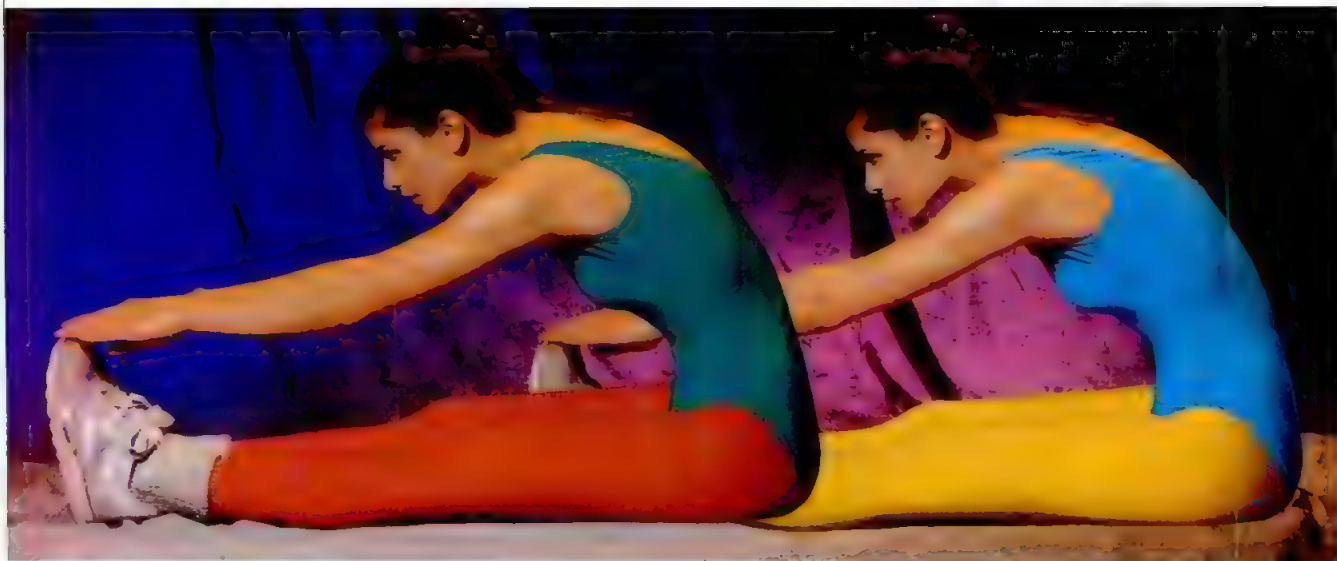
SMART VIDEO

When life hands you lemons, make lemonade. When technology leaves you with incompatible VHS decks and 8-mm camcorders, make home videos. Gold Disk's Video Director is the software that lets you do it. Video Director comes with a swell little cable that plugs into the Control-L socket on your camcorder and has a computer-controlled infrared transmitter that gives your VHS deck its marching orders. You load a tape into your camcorder, and as you watch, mark the beginnings and ends of scenes. You do it all from your keyboard or with the mouse. Then you arrange the scenes in the order you want them, connect the video and audio cables between your camcorder and VHS deck, and sit back. Next thing you know, you've got a VHS dub of your 8-mm images. You have full control of both machines from your computer screen, so you could conceivably insert one of those wipe/dissolve/effect generators between the two decks and make some of the transitions manually, and insert a sound track or whatever else pleases you. Don't get me wrong—this is no Video Toaster. You aren't going to make rock videos with this equipment. You will, however, be able to make home videos in the universal, archival VHS format from your camcorder. You could buy dedicated hardware to do this kind of stuff, such as Videonics' Thumbs Up! and DirectED, but we're *computer* people.

DUMB SEQUEL

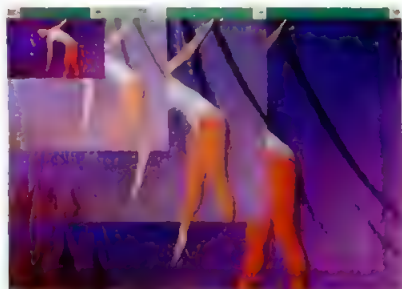
Everyone knows we in the computer press are slaves to MCI Mail. It's a powerful system, but the interface is the pits. Lotus Express has been the product to work in the background, collecting and sending messages and generally putting a pretty face on the service. Unfortunately it's a big TSR, it fights with many other programs, and it knows nothing about 9,600-bps modems.

MCI bought the rights to Lotus Express a while back. It's just brought out MCI Express. It knows about 9,600-bps modems, but in every other respect came out about six months and two versions too early. Bigger, slower, more features. Swell. □



Exercise Your Video ... Stretch It!

Why settle for an out-of-shape graphics board? Let ATI's new GRAPHICS ULTRA+ and GRAPHICS ULTRA PRO cards pump up your computer with graphics and multimedia video acceleration.



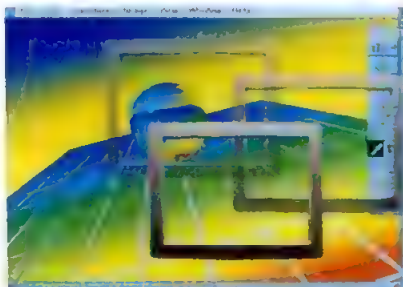
Only the GRAPHICS ULTRA+/PRO cards come ready to accelerate¹ multimedia applications under Windows. Stretch small video images to partial or full screen for better visibility ... and maintain smooth dynamic motion (when others fall behind).

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mach32
ATI TECHNOLOGIES INC.

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- ▶ Accelerated 1024x768 at 65,000 colors
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- ▶ Multimedia Video Acceleration
- ▶ Fast zero wait-state VGA
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- ▶ 5 year warranty
- ▶ Priced from \$399.00³



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- ▶ Even faster performance with VRAMs
- ▶ Accelerated 1280x1024 at 256 colors up to 74Hz non-interlaced
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- ▶ Priced from \$599.00³



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CIRCLE 228 ON READER SERVICE CARD

A high-contrast, black and white close-up portrait of a man, likely a professional athlete, looking slightly to the side with a subtle smile. The image is heavily shadowed, emphasizing his facial features.

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John C. Dvorak

The "Dummy" Phenomenon

Dummy books. It started with a stroke of genius called *DOS for Dummies*, and now we can expect to see a slew of *Idiots' Guides*, *All You Ever Wanted to Know...*, *DOS for Dopes*, *DOS for Dolts*, *DOS for Boneheads*. This kind of book has

been the bane of my personal life ever since my wife first tried to get me to sell a similar book. But over time, established publishers all said the same thing: "Books for beginners don't sell."

Okay, I always believed this assertion was stupid, and now I get to say I told you so. Now, because of the *DOS for Dummies* phenomenon, every publisher is cloning the idea.

Let's face it, going into a bookstore and buying a book that says "You're a dummy" is aggressive. "Yeah, I'm a dummy! What are you looking at?!!!" Worse, to see a wall of these books in a bookstore—a place where literacy and education is equated with prestige—is an anomaly, a weird anomaly. "Dummies, the books for you are in aisle six. Attention all dummies!" I'd love to be a checkout person. "Ah, I see we have another dummy here. Exactly how dumb are you?"

Maybe I'm bellyaching, but just hear me out. Everyone is missing the point. A huge contingent of the public wants to know about computers but isn't being served.

So what's going on here? It's a consumers' revolt, nothing else. Newcomers to a market without a magazine for beginners have risen up and are buying these books to protest the fact that they're not being served. It's a genuine spasm of the collective unconscious, and the computer industry hasn't a clue what to do.

In fact, the beginning guides have always done well, but bookstores have never had a runaway best-seller. Since bookstores are bandwagon jumpers, sales for these books soar with over a million in print. Actually, the text of many of them is surprisingly advanced—hardly the stuff for "dummies."

These books don't

help, but they do reflect some insidious problems. First, the whole computer scene makes beginners feel like dummies. They don't feel like beginners (hence the failure of beginners' books). I'm surprised dummies' clubs don't form. Second, the school systems of this country are still using Apple II's in the classrooms (and proud of it!). Sheesh. Third, courses in computing are hard to find, and corporate computer training is spotty. Many people have children who know more than they do. They can't get jobs if they don't know about computers, and they can't learn about them unless they work someplace that teaches them. But companies expect that people all have rudimentary knowledge.

There is nothing on the horizon to change this—except books. Unfortunately, "Books for beginners don't sell." You see the vicious circle, and the Dummy books are the protest movement.

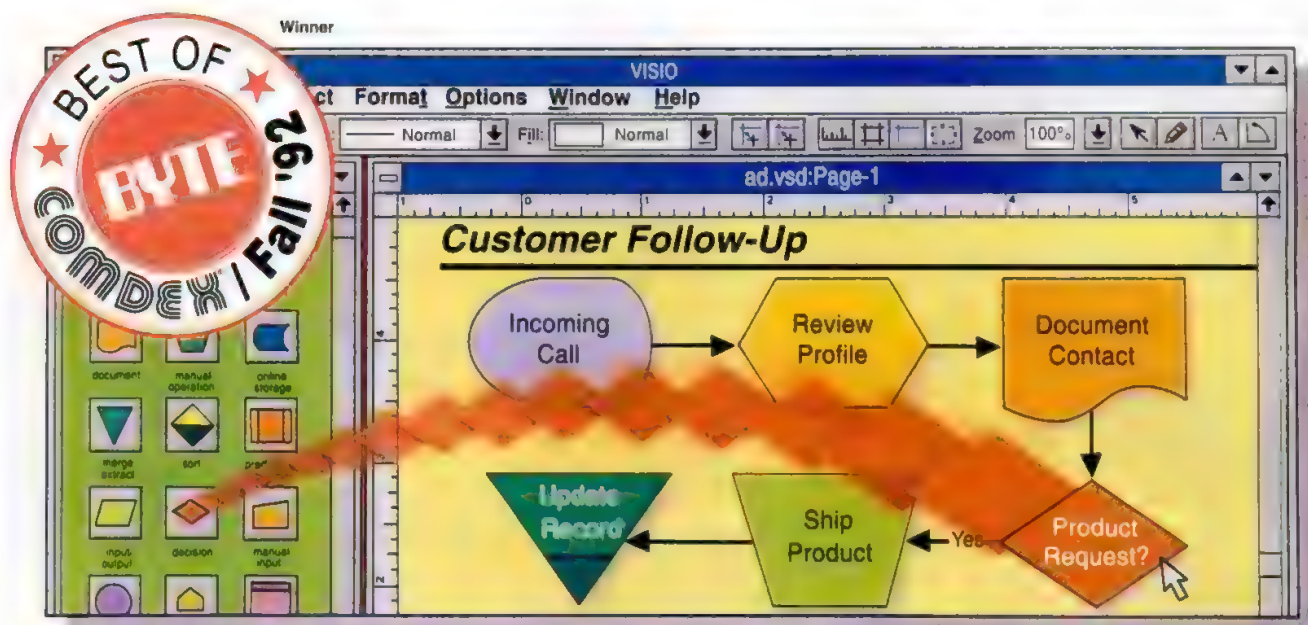
The question I ask these dummies is: Hey, where have you *been* the last fifteen years, anyway? Living under a rock? Everyone should be computer literate by now. I've certainly done my part as a writer and editor trying to help. Don't blame me.

Here we are in 1993, and people are just now getting into computers, when they're more complicated to use than ever. There are few beginners' guides. The magazines will have nothing to do with beginners who never renew subscriptions—once they learn the basics they move on. User groups eschew them. There are no true beginners' computers. All these amateurs have are Dummy books. These people better see that this is their last chance to get on the boat, because the ship is sailing for good once this "beginner" fad ends.



The success of "dummy" books is nothing more than a consumer revolt, a spasm of the collective unconscious.

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Inside Track

K

iller 486 Dept.: AMD and Cyrix are beating down the 486 door in their never-ending **battle** with Intel, as both intend to roll out 40-MHz versions of the chip. Both companies have been **boosting** the newest version of the VESA VL-Bus standard that allows it to operate at 40 MHz instead of its current 33-MHz limit. The VESA committee is influenced by the **threat** that the Intel local-bus standard, which hasn't been commercialized, should allow for the higher speeds.

Cyrix will be selling a variety of plug-in 386-pin-compatible chips that users can install in existing 386 systems. Dubbed the Cyrix DRu2, the chip provides the Cyrix 486 model with a **clock-doubled** technology incorporated. In other words, if you have an old 20-MHz 386 machine, you can drop one of these little chips into the 386 socket and double the performance of your machine. MIS directors are expected to use this upgrade path to save money and give everyone 486 power.

AMD is more ambitious and charging Intel in the mass market with a line of 486s that will **stun the industry**. Most observers have already figured that AMD will roll out a 40-MHz 486DX and a 40-MHz 486SX. But the company seems destined to announce before year's end a clock-doubled 486 running at 80 MHz, and perhaps a **clock-tripled 486** running at an **astonishing 120 MHz!**

If that isn't enough, both Cyrix and AMD have indicated that they are developing a **586 chip** to compete in the Pentium arena. Since neither company has a working Pentium to clone, they have each decided to make high-performance **superscalar superset 486 chips** modeled after the Pentium, but not exact clones. Whatever develops, we have a couple of years ahead of us when the desktop performance will double again and again.

The Future of Telecommunications Dept.: It's called The Sierra Network (TSN), and it comes from Sierra On-Line, the game company. When I first heard of this thing I didn't think much of it, but now that I've seen TSN in action, I realize that *this* is the **future of on-line services**. While The Sierra Network is aimed purely at the entertainment market, you can see where the concept can be used for other on-line services. This is the way Prodigy should have been designed.

*Cyrix will be selling
its DRu2 chip. Drop
this puppy into your old
386 and a 486'll start
barking. Meanwhile,
AMD is planning
an 80-MHz 486 and
perhaps a clock-tripled
120-MHz 486. Ouch!*

TSN essentially uses the computing power of the remote (desktop) computer to do most of its graphical work. It comes with **five HD disks crammed** with the graphical world that the user visits. There are Larry Land and other diversionary worlds designed for on-line chatting. There's a gambling hall where you play on-line in real time with other callers. Users are represented by a face (that you design). The mouse is used extensively. Because almost all the graphics are local, the response time is **incredibly fast** even on a slow modem. The remote modem exchanges mostly text, tokens, and pointers with the host. It's very elegant in concept and **execution**. Call 1-800-SIERRA-1 to get a free

sign-up kit consisting of the disks and three hours of free on-line time. Very hot!

The Machine of Choice Dept.: Almost overnight, the IBM ThinkPad 700C color notebook has become the standard demo machine for software vendors who want to show off their wares while traveling from town to town. With its cute **nub-pointing** device, the ThinkPad is perfect for OS/2 or Windows, especially when **loaded** with 16MB of RAM. Thought you should know.

DOS on a Mac? Mac on DOS Dept.: In the last few weeks there was an incessant rumor about someone—who knows who—releasing a version of DOS for the Macintosh. There are no details at all about why anyone would do this, and I believe that the rumor stems from something quite different that I've seen—an executive shell for MS-DOS that looks exactly like the Mac interface. There is no reason this same true Mac look and feel can't be coded to **replace the Windows executive**, and I'll be surprised if one isn't available soon.

One Windows interface replacement will be a PM-type shell. **IBM is rumored** to be developing such a shell so it can wrest people away from the Windows model and swing them over to OS/2.

Picky, Picky, Picky Dept.: From Paris comes this letter from Philippe Gros:

"Many thanks about your article about software piracy overseas. But when you say that you can ship to Bordeaux for half the price, you're wrong. . . My personal record was to buy CorelDRAW in U.S.A. seven times cheaper than I could find it in France. That lower price includes shipping cost, value-added tax (VAT), and customs duty!! Yes John, something is definitely wrong over here!" □

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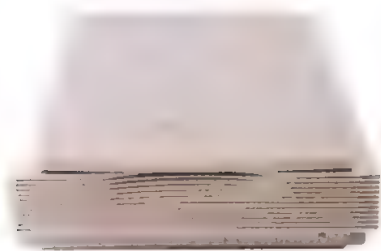
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Jim Seymour

The State of the DOS Gods

We haven't seen many major upgrades of mainstream DOS apps lately, as developers have been seduced by the booming Windows market. A few new whole-number upgrades are about to appear, but don't be fooled: The tide is not changing.

A year ago, I suggested that many of the DOS mainstays were in a kind of twilight zone, nearing the end of their lives as high-volume, frequently upgraded mainstream products ("Twilight of the DOS Gods," *PC Magazine*, March 17, 1992).

Harvard Graphics was my prime example. When Harvard's Version 3.0 came out in 1991, it stretched the notion of what a DOS presentation-graphics package could do. Two years later, that achievement is still remarkable, if no longer very important. Windows graphics packages (including Harvard Graphics for Windows) make it quick and easy to do what seemed heroic in HG/DOS 3.0.

But a lot of people still rely on that program. In one shop I know, the overwhelming majority of graphs are like notebook pages—quick and dirty records of the day's readings in the labs. They still use Harvard 3.0, and love it: It's so simple to type in that grid of numbers, hit a key to see the results in graphical form, then print the graphs and pop them into the file cabinet.

But other PC users who have chosen to stay in the world of DOS do need more than their present, aging software offers. Vendors have not served these users well by dragging their feet on upgrades. Microsoft, for example, last shipped a whole-number revision of Word for DOS, Version 5.0, in November 1988, almost five years ago. Version 5.5, which shipped in November 1990, added few new features and merely replaced the clean, elegant Word interface with a grubby, fake-Windows look full of pull-down menus and surrender to IBM's feeble Common User Access "standard."

WordPerfect has been even worse. WordPerfect

5.0 shipped in May 1988; in November 1989, the company shipped Version 5.1—also a relatively limited upgrade. Nothing since then.

And Lotus has really dragged its feet. We first saw Release 2.0 of 1-2-3 in September 1985, and the long-awaited Release 3.0 in June 1989. For competitive reasons, Lotus has maintained both the 2.x and 3.x product lines; 2.4 appeared in May of 1992, and 3.4 in December.

Since those last major DOS upgrades, Microsoft has gotten out two major releases and four interim upgrades of Word for Windows; WordPerfect has shipped two major releases of WordPerfect for Windows; and Lotus, you guessed it, has cranked out two major releases of 1-2-3 for Windows.

GOOD NEWS, BAD NEWS

There is some good news here. Word 6.0 for DOS and WordPerfect 6.0 for DOS will appear about the time this issue hits the stands. But don't look for a 1-2-3 4.0 this year.

While the biggest companies have given their customers little more than new printer drivers over the past few years, Borland has won friends with a steady series of releases of Quattro Pro for DOS. Versions 1.0, 2.0, 3.0, and 4.0 appeared in steady progression, from September 1989 through February 1992. But we haven't heard anything since then, and I don't expect to see a new version of Quattro Pro for DOS until much later this year.

There are a number of reasons for these delays. Redirecting development resources to Windows products is an obvious one. Also, software development is a bet on the future, and few software



*Is there hope for aging DOS apps?
Not likely. Few developers see a future
for the operating system.*

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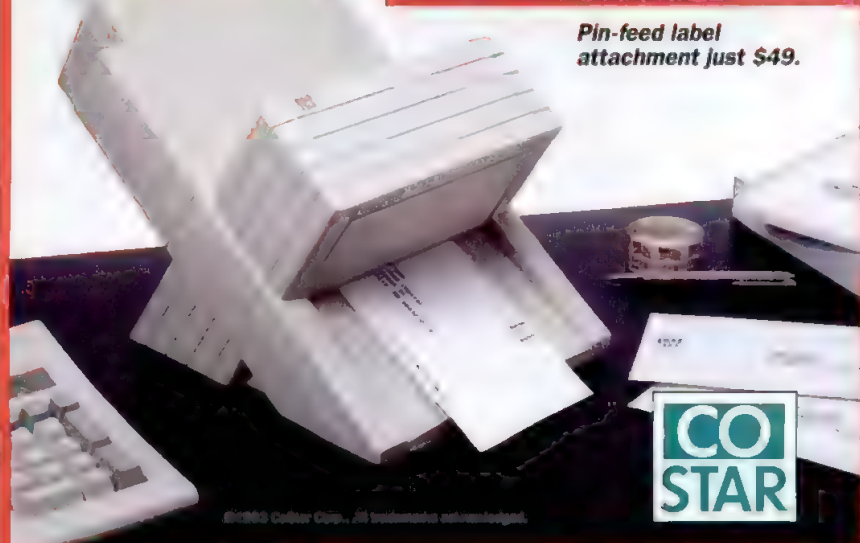
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Jim Seymour

firms believe DOS is our future. And some of the vendors speak of "letting sleeping dogs lie," referring to the large number of their DOS customers who are happy with what they have and not interested in spending money on upgrades.

There are also company-specific reasons for these delays. WordPerfect and Lotus were struggling desperately with development of their Windows versions. Borland was struggling with everything. And Microsoft, despite its wish to hold on to DOS Word customers, is doing everything in its power to convert the world to Windows and Windows applications.

The bad news for confirmed DOS users is that things aren't going to get any better. I predicted a year ago that we'd never see Harvard Graphics 4.0. We haven't, and wearen't going to. Though there will almost certainly be one more major revision of 1-2-3 for DOS users in the future, and probably Word and WordPerfect 7.0s (if only for the upgrade revenue), sales of DOS-app upgrades has fallen beneath the threshold of pain for large companies.

FILLING IN

The good news is that small companies are stepping into the breach. SymSoft (702-832-4300), for example, has just introduced slide-sorter and outlining add-ons for Harvard Graphics/DOS 3.x.

Slide Sorter works with HG 3.x, and gives you a choice of 1, 4, or 16 slides on-screen at once. You also see the text description saved with each slide. In the 16-slide view, text can be hard to read, making it hard to work with several similar text slides. But you can easily toggle between the 4-slide view and the 16-slide view.

Slide Sorter uses a cut-and-paste routine to move slides, rather than the much more elegant drag-and-drop of Windows graphics programs. But does the job done quickly.

SymSoft's Outliner works with HG/DOS 2.3 or later, and while useful is more clumsy. It can be used by itself to produce word-chart slide shows, which may be the problem: It feels like what it is, a standalone program modified to accommodate HG/DOS files. Still, if you want outlining under HG/DOS, it's your only bet.

Staying with DOS apps increasingly means forgoing many of the best features of new PC software design. I fear that isn't going to change. □

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FOR THOSE
TRYING TO RUN
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NOT A
COMPUTER.**

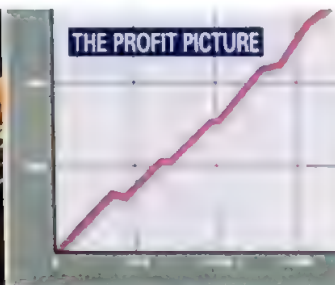


If you're a Windows user, Windows for Workgroups is the easiest way to network. If you're not using Windows, it's one of the best reasons to start.

Left: Windows for Workgroups makes it easy for groups to share files and information. Right: Which makes it much easier for you to show a profit.

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Bill Howard

New Standard-Bearer

Who controls the PC standard? Originally IBM and Microsoft had joint custody, and IBM was the dominant parent. Today it's Intel and Microsoft, and they're equals—Intel supplanted IBM when IBM went off to found the Micro Chan-

nel commune in 1987. Tomorrow it may be Microsoft alone. Currently, the essence of being a mainstream PC means the system uses an Intel-based CPU. And it runs DOS and Windows. But there's no reason why future PCs must conform to the so-called x86 architecture created by Intel and supplemented by AMD, IBM, and Cyrix. The future soul of the new PC may be any one of a half-dozen RISC-based CPUs.

The microprocessor inside your next PC may well be Digital Equipment Corp.'s Alpha, Hewlett-Packard's Precision Architecture (PA) RISC, MIPS Technologies' R4000 or R4400, or IBM's Power PC. As long as the computer runs your existing library of DOS and Windows apps and their next-generation 32-bit offspring, you've got a PC-compatible computer.

This is not some far-off concept. It will be reality by mid-year, when Microsoft Windows NT is scheduled to ship. Alpha- and MIPS-based systems will ship in concert with the NT rollout. Naturally, dozens of Intel-architecture PC manufacturers will have NT-certified 486 and Pentium systems as well. It is the scalability of Windows NT—its ability to run on a variety of CPUs powering everything from desktop PCs to technical workstations to file servers—that may loosen Intel's stronghold. And strengthen Microsoft's.

For these non-Intel-architecture chip makers, getting to the market is only a first step. A bigger step lies in market acceptance. For that to happen, (a) Windows NT has to take off, (b) we have to migrate from 16-bit Windows to 32-bit Windows NT software, and (c) the RISC platforms either must show a compelling performance advantage or offer a cost-competitive no-hassle substitute.

A rule of thumb is that when you upgrade, you want the new product to be twice as good as what you're replacing. But existing Windows apps won't show a big performance improvement on the RISC systems under NT; they may even run slower because they must go through a translation layer and because the Pentium will match the RISC chips when running mainstream apps (though not on floating-point operations).

AMD and Cyrix proved their compatibility with existing software by being compatible with Intel chips. The next generation of CPUs will provide compatibility indirectly. They'll be compatible with Windows NT, which will be compatible with your software.

This is the spiritual resurrection of the Advanced Computing Environment (ACE) consortium, the ill-fated 1991 alliance of Compaq, Zenith Data Systems, and dozens of others that hoped to create an Intel-alternative for future workstations. ACE didn't survive, but the vision lives on.

All this presumes the successor to DOS and Windows to be Windows NT. It's possible IBM may finally jump start OS/2—or get it running long enough to pave

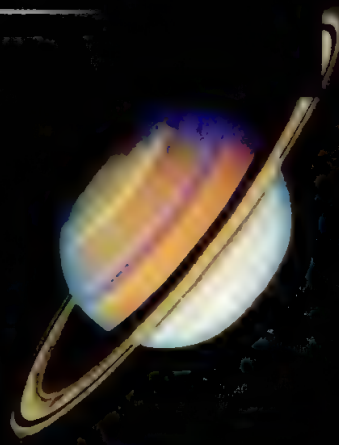
the way for Taligent's so-called Pink operating system. Or Novell could breathe life into Unix on the desktop, or Hewlett-Packard, IBM, and Sun Microsystems could successfully build a single Unix standard.

Five years from now, the computer that is sitting on your desktop may use a non-Intel CPU, and it may (but probably won't) run a non-Microsoft OS. Intel will probably be the major CPU vendor, but it won't dominate the market the same way it does today. That leaves Microsoft as the single standard-setter. □



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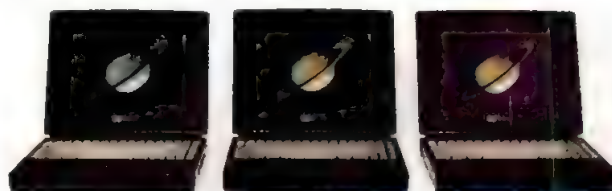
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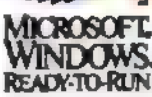
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The Green Machine

Can your computer be more efficient, safer, and less hazardous to the environment? *PC Magazine* takes a look at how technological trends in health, ecology, and ergonomics are producing a new breed of PCs.

When we first got so hopelessly addicted to personal computers, they seemed to be more than mere machines. For many, the PC came to be workmate, friend, and confidant all rolled into a squat gray box. Despite spawning the most important office revolution of the century, which has led to previously unthought-of possibilities and efficiencies, the personal computer's many and varied positive attributes today are balanced by several negative factors.

Just as too much of a good thing can be bad for even the strongest constitution, the cumulative effect of the approximately 60 million PCs that adorn our desks, floors, and laps on the environment and on users' health is starting to be of concern to users, manufacturers, and the general public. In an age when people demand political correctness even of their appliances, the PC industry is responding with a whole new category of computers. Coming soon to a desk near yours: the green PC.

There's more than mere faddism at work here. After all, the unmistakable warning signs are all around us: from wastebaskets bulging with near-perfect

by Brian Nadel

Product photograph by Mark M. Lawrence; Photo illustration by Christopher Gould



documents to empty offices lit by the glow of monitors and computer users with wrist bandages. The most pressing PC issues of the day include:

- **Power.** The Environmental Protection Agency estimates that PCs and their peripherals waste \$2 billion of electricity annually and indirectly produce as much carbon dioxide as 5 million cars do.
- **Consumables.** Laser-printer cartridges, batteries, and paper are adding to America's landfill problems.
- **Health.** Personal injuries, ranging from back strain to cumulative trauma disorders, are becoming commonplace.

The good news is that through the combination of common sense and emerging technologies, progress is being made toward finding workable solutions. Technical advances are enabling PCs and monitors to consume less energy by allowing them to power-down when they're not being used. New printers lower electrical use, as well. Reduced electromagnetic-emission monitors are now common and aren't more expensive than older models. These technologies can save not only energy and the environment, but they can save you money.

CHARGED WITH POWER

At present, computers are a leading cause of increased demand for electrical power, accounting for an estimated 5 percent of commercial demand, which includes industrial and office use, according to the EPA. If current trends continue, the amount of energy that goes to PCs could grow by 10 percent before the close of the decade. Based on an EPA survey of office equipment, 74 percent of such energy use goes to PCs: 49 percent to PCs and their monitors and 25 percent to printers. While the cost varies by region, the typical PC uses about \$35 of electricity per year for a system that is on 8 hours per day, compared to \$105 per year for a system that is never turned off.

The dismaying fact is that there are PC users who squander energy. The EPA's survey of PC use shows that 30 to 40 percent of computer users leave their machines running days, nights, and weekends. Some profligate users point to the convenience of using a remote-control program that requires the base machine to always be on; others fear that too many

power-ons will shorten components' life. However, the simple fact is that most users are too lazy or impatient to turn their machines off at night and reboot them in the morning.

Monitors can save energy as well because, based on EPA estimates, 80 percent of the time a monitor is on, no one is looking at it. Two possibilities exist: liquid crystal displays and cathode ray tubes that power-down. Those popular screen

savers that project everything from "Star Trek" trivia to psychedelic images consume up to 20 percent more energy than a blank screen. A quick and painless way to reduce energy use would be to set the screen saver program to clear the display after 3 to 5 minutes of inactivity.

To discourage waste, the EPA created the "Energy Star" program with participation from 50 of the PC industry's largest companies, including Apple, Com-

H I G H L I G H T S

Power, Environment, Health

THE GREEN PC encompasses new technologies that reduce electricity use, eliminate or reduce consumable materials, and attempt to cut down on the health hazards of PC use.

OFFICE PCs are a paradox: They represent the fastest growing category of electrical use, but also make us more productive.

IBM LEADS THE WAY with its Energy Saver PC, which cuts power consumption by three-quarters compared to a conventional system. Key to its stingy consumption are the use of a portable PC's power supply and an LCD and the processor's ability to go into a low-power sleep mode.

A FEW SIMPLE SOLUTIONS to vexing environmental problems can go a long way. Turn off your PC when it is not in use; set the screen saver on blank display; view documents electronically; use e-mail; and recycle paper, toner cartridges, and floppy disks.

THE EPA'S ENERGY STAR program rewards computer and monitor makers that have been able to pare energy use to below 30 watts at idle. A parallel program is underway for printers and peripherals.

AN ERGONOMICALLY FRIENDLY office starts with furniture that adjusts to your body, not vice versa. Heed common sense and comfort in the search for a healthy workplace.

TAKE FREQUENT BREAKS, if you type a lot, to avoid wrist pain. Your supervisor may not like it, but it will make you a healthier and more productive worker and may reduce future medical costs. Programs that impose a periodic exercise break are a good solution for workaholics.

FAR-OUT KEYBOARDS can help, but choose one that is comfortable and familiar. Accessories such as a wrist rest may help with a sore hand.

MOST MONITORS we tested met the MPR II standard for reduced electromagnetic radiation emission. It costs no more to buy an MPR II monitor, and image quality doesn't suffer. The one that failed was easily retrofitted to pass the test with two off-the-shelf products.

80 PERCENT OF THE TIME a monitor is on, nobody is looking at it, according to the EPA. Some low-power monitors are based on liquid crystal technology, but they suffer from being too small. Others are traditional CRTs that power-down.

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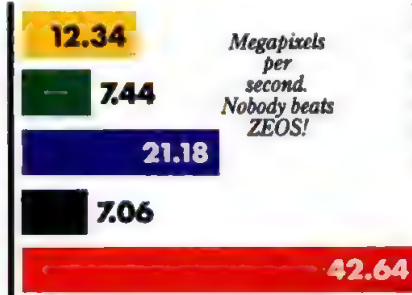
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—PC World, February 1993, Best Buy

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*—PC Magazine,
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*—Jim Seymour, PC Magazine
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*"Kudos for
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These features
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*—PC Computing,
March 1993,
Best Value*



*"ZEOS'
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*—Forbes,
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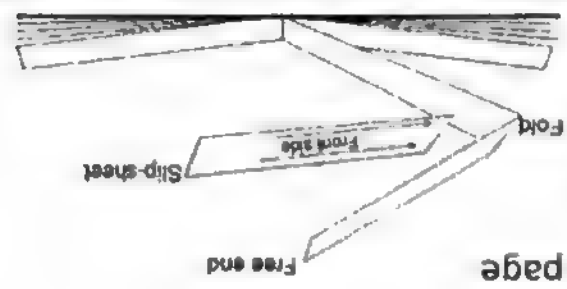
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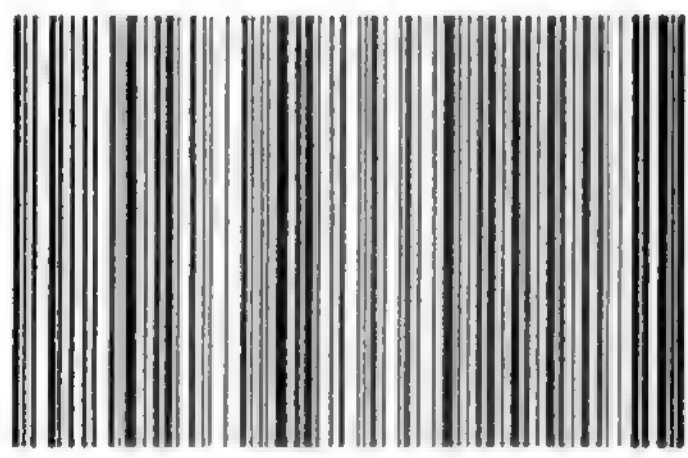
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4. Close the page and slip-sheet

Inverted Foldout slip-sheet

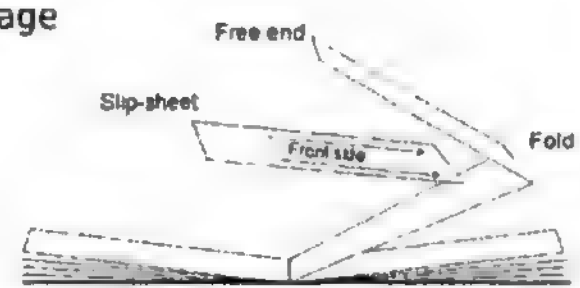


GbsSlipSheet-001

Folded edge of the page

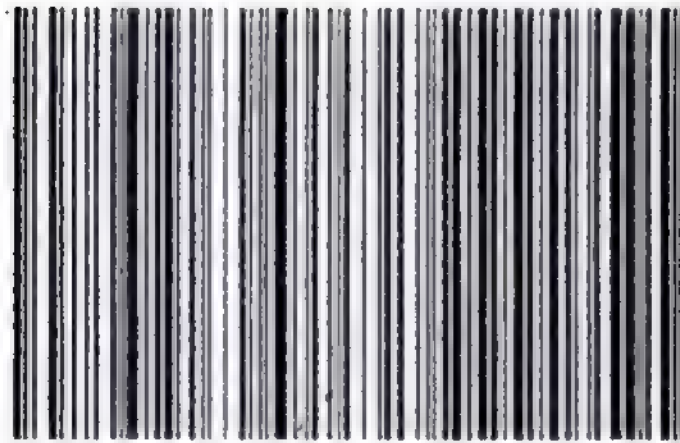
Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlipBack-001B

Back

1. Follow instructions on the other side

based OverDrive™ processor. And your ZIF (Zero Insertion Force) socket makes it so easy!



Yet CPU upgradability is only part of the story. Because you also get *eight expansion slots*, seven of which are open, giving you plenty of room to add to your system later. *And you get Flash BIOS, allowing for easy BIOS upgrades in the future by disk or modem!*

ON-BOARD SCSI ONLY \$49!

Everybody is talking SCSI. So we've also

strong cases, floppy drives by Teac, and .28mm dot pitch SVGA monitors that are non-interlaced all the way up to 1024x768 resolution.

UL LISTING ON THE ENTIRE SYSTEM.

Another rare—and important—symbol of quality is the UL® Listing. *All ZEOS upgradable systems—not just the power supply—are UL Listed.* Don't be fooled—others often only have their power supply as UL Listed. UL listing means our systems have



Your #1 Choice.

added an extremely inexpensive, yet very high performance on-board SCSI option for you. By simply adding a \$49 Adaptec SCSI chip (now *or* in the future) you can run any SCSI I or II device such as CD-ROM drives, tape backups and more. These run right along with (or instead of) your standard IDE drives. As well as with any other SCSI options you desire.

ZEOS DESIGNS AND BUILDS THE VERY BEST MOTHERBOARDS JUST FOR YOU.

The new ZEOS upgradable motherboards are six layers thick. And fast 36-bit memory SIMMS provide you with optimum flexibility—supporting up to 64MB right on the motherboard!

Plus, these motherboards are optimized to help our systems exceed the stringent FCC Class B requirements for EMI emissions. As a matter of fact, *all ZEOS systems have earned a FCC Class B listing.* This listing means fewer radio emissions and less potential interference with other equipment.

"AN ARRAY OF FEATURES TO MAKE A USER'S MOUTH WATER."

—PC MAGAZINE

If you spend as much time with your PC as we think you do, you know what a difference high-quality components can make. Such as

passed rigorous tests, and that says a lot about safety and quality. UL listing means your peace of mind.

NOT ONE, BUT TWO COOLING FANS.

Peace of mind comes from other things, too. *Like a high capacity power supply with built-in surge suppression. And twin cooling fans.* While ZEOS systems run cooler than most with just one fan, we still give you two whisper-quiet ones. Because the cooler your system runs, the longer it will last. Particularly with today's high-performance CPUs.

WHEN IT COMES TO AFTER-THE-SALE SUPPORT, ONLY ZEOS OFFERS YOU SO MUCH.

A lot of vendors think their responsibility is over once the PC is shipped to you. At best, most offer only part-time technical support. At ZEOS, we support you *toll free, 24 hours a day, 365 days a year.* Your own ZEOS award-winning Technical Support is only a phone call away—*anytime* you need us.

And if you're not absolutely convinced your new ZEOS



Buy with confidence. PC Magazine Readers' Choice for Service and Reliability! ZEOS was the only PC vendor to receive the "Excellent" rating for both desktop and laptop systems.

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A lot of computer companies are big on promises—but small on delivery. Not ZEOS. With our exclusive *Computers Now!*[™] program, you can get same-day shipping on our most popular configurations—both desktops and notebooks! What's better, we guarantee to ship your system the same day you order—or we ship it at our expense!

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Many, many popularly-configured ZEOS systems are pre-built and ready to ship. While supplies last, we'll ship your system to you the day you order subject to these conditions:

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Circle 151 on reader service card.

A. YOUR PERSONAL INFORMATION

Please complete all appropriate sections, providing at least two years residence and employment history. **THIS IS NOT A CREDIT AGREEMENT!** One will be sent to you upon authorization of an account. (This form must be signed to process your application.) All financed purchases are subject to credit approval. If you have any credit questions, please call 800-421-8942 for assistance. Thank you!

Name _____ Previous Address _____
Home Phone (_____) _____ City _____ State _____ Zip _____
Soc Sec No. _____ Date of Birth ____/____/____ Employer _____ Since? (Mo./Yr.) _____
Address _____ Apt. _____ Monthly Gross Salary \$ _____ Daytime Bus. Phone (_____) _____
City _____ State _____ Zip _____ Previous Employer _____ From _____ To _____
Since? (Mo./Yr.) _____ ☐ Buy ☐ Rent ☐ Other _____ Occupation _____

A married person may apply for individual credit. I am applying for (please check appropriate box):

☐ **JOINT CREDIT** with another person. Complete entire application.

☐ **INDIVIDUAL CREDIT** but rely on income or assets of another person as a basis for repaying the credit requested. Complete entire application.

☐ **INDIVIDUAL CREDIT**. Do not complete section C **

** If you are a married Wisconsin applicant, you must provide your spouse's information as indicated, even though your spouse may not be signing the contract.

Income from alimony, child support or separate maintenance payments need not be disclosed if you do not wish to have it considered as basis for repaying this obligation.

Additional Monthly Income \$ _____ Source _____

Name & Address of Nearest Relative Not Living With You _____

NOTICE TO WISCONSIN APPLICANTS:
YOU MUST DISCLOSE YOUR MARITAL STATUS
☐ married ☐ unmarried ☐ legally separated

Relationship _____

B. CREDIT INFORMATION

PLEASE TELL US IF YOU HAVE A:

Checking Account ☐ Yes ☐ No
Savings Account ☐ Yes ☐ No

Y/N How Many?

Y/N How Many?

Bank Loan _____ Dept Store Charge Card _____

VISA _____ Credit Union Account _____

MasterCard _____ Other Major Charge Cards _____

Finance Company Loan _____

C. JOINT APPLICANT INFORMATION

Joint Applicant's Name _____

Soc Sec. No. _____ Date of Birth ____/____/____

Address _____ Apt. _____

City _____ State _____ Zip _____

Home Phone (_____) _____ Date of Residence (Mo./Yr.) _____

Joint Applicant's Employer _____ Since? (Mo./Yr.) _____

Bus. Phone (_____) _____ Monthly Gross Salary \$ _____

CUSTOMER AUTHORIZATION

I authorize ZEOS International, Ltd. or its assignees to investigate credit records and to report my performance hereunder to credit agencies. I hereby certify that the following information is furnished to you for the purpose of obtaining credit and is true and correct to the best of my knowledge and belief.

Applicant's Signature _____ Date _____

Joint Applicant's Signature _____ Date _____

FOR MARRIED WISCONSIN APPLICANTS: I acknowledge that the obligation described herein is being incurred in the interest of my marriage or family.

Buyer's Signature _____ Date _____

There are costs associated with the use of this credit card. To obtain more information about these costs, call us at 800-421-8942 or write to ZEOS, Z-Card Processing Center, 1301 Industrial Blvd., Minneapolis, MN 55413.

NY-A consumer credit report may be requested in connection with this application or in connection with updates, renewals or extensions of any credit granted as a result of this application. If I subsequently ask for this information, I will be informed whether or not such a report was requested and, if so, the name and address of the agency that furnished the report.

OH-The Ohio laws against discrimination require that all creditors make credit equally available to all creditworthy customers and that credit reporting agencies maintain separate credit histories on each individual upon request. The Ohio Civil Rights Commission administers compliance with this law.

*Financing not available in Alaska, Hawaii or outside the continental U.S.

ZCD-PCM-9305B

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Z-Card

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EXP 01/94

Here's another great reason to buy a ZEOS system: the Z-CardSM! The Z-Card works just like a MasterCard or VISA—so you can charge your ZEOS purchases and pay in easy monthly installments. And since no down payment is required, it makes buying your new ZEOS system easier than ever!

You can apply for your very own Z-Card and low, low monthly payments right now. Simply fill out this application and fax it to 612-633-7507. Or mail it to ZEOS International, Z-Card Processing Center, 1301 Industrial Blvd., Minneapolis, MN 55413. We'll contact you as soon as your credit line is established, usually within 24 hours of receipt. Apply today!

paq, Hewlett-Packard, and IBM. The goal is to reduce power use at idle for a PC to 30 watts for each of the system's main elements: CPU unit, monitor, and laser printer (larger printers can use up to 60 watts). In return, vendors can use the Energy Star logo as a marketing aid. According to Jim Turner, PC director for IBM's PS/2 line, "The challenge will be to produce low-power PCs and peripherals at little or no extra cost."

The first low-power products borrow much from notebook technology. Intel's 486SL line and AMD's Am386SXLV line of CPUs combine 3.3-volt operation and a system management mode that lets the processor go into an energy-saving sleep mode when it is not being used, allowing the reduction of power requirements by up to 50 percent. Intel plans to use many of the SL's attributes in its mainstream desktop chip lines.

IBM FIRST

The first entry in the low-power PC arena will be a technology demonstration system for IBM's PS/2 line that the company internally calls its Energy Saver model. Expected to be introduced early this summer, it is a 4-pound system in a sleek 12 by 12 by 4.5-inch box. It is engineered around IBM's 3.3-volt IBM 486 SLC2 microprocessor, which is a licensed offshoot of Intel's 486 CPU.

Running at a clock-doubled speed of 25/50 MHz, the processor can be slowed to a dead stop if no computing is needed and return to full speed in an instant. The system includes a 3.5-inch floppy drive, a 120MB hard disk, 4MB to 16MB of system RAM, and four PCMCIA slots.

Inside the ultra-slimline case, there is

no conventional power supply because IBM's Energy Saver uses a power adapter from a portable computer. Not only does this deliver electricity more efficiently than a conventional power supply, it makes operation silent because

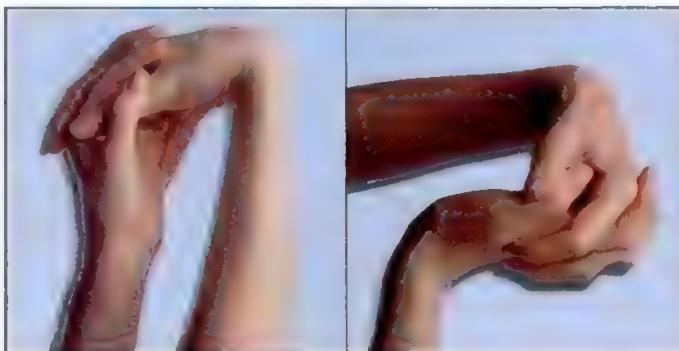
to save 90 percent of its peak power consumption. Nanao recently added a 17-inch and a 20-inch monitor to this line. Each monitor goes through three stages of dormancy, but is always ready to resume normal operation (see "A Look

Behind the Screen"). We measured power consumption on a 17-inch Nanao 760iW and found peak use to be 140 watts, versus 11 watts at idle. Low-power operation comes at no additional cost, because Nanao's new 17-inch monitor costs \$500 less than the model it replaces.

The next step is to apply these lessons to printers, specifically laser printers. Lexmark, which makes printers under the IBM name, has

created a model that will idle at under 20 watts, compared to previous models that use 300 watts when printing and almost 70 watts when idle. The price is the 30 seconds of warm-up time needed to rouse the printer and ready it for your job. By mid-year, Hewlett-Packard will introduce a new LaserJet that will idle at 5 watts, compared to from 40 to 85 watts for its present printers. Based on instant-on fuser technology, the new printer will be able to print without extra delay.

Isometric Hand and Wrist Exercises



Lock fingers and gently pull in or push together for 30 to 60 seconds per hour.

there is no cooling fan. While heat buildup may preclude more powerful processors for the moment, the system's designers are working on models that cool more efficiently.

Another difference is its display. While sharp and bright, the 10.4-inch active-matrix color LCD is smaller than that of the more conventional 14-inch monitor. When the system is introduced, a reduced-energy CRT will also be available, but it will use significantly more energy than the LCD panel.

We tested the power consumption of an Energy Saver workstation to see how it compared to a traditional PC system. At peak computing, the system unit and monitor together consumed a total of 36 watts of power, versus 162 watts for a conventional system of similar performance.

The bottomline is that power is decreased by three-quarters.

The first power-down monitor to make it to market comes from Nanao USA Corp., based in Fremont, California. The firm's 15-inch Flexscan F340iW monitor, which was introduced at last fall's Comdex, can power-down in stages

A decade ago, the PC held the potential to be the engine that would drive the paperless office. The irony is that we're using more paper than ever.

PAPER CHASE

A decade ago, the PC held the potential to be the engine that would drive the concept of the paperless office into existence. The irony is that we're using more paper than ever. U.S. businesses consume 775 billion pages of paper per year—the equivalent of a 48,900-mile-high stack. As we all

know, much of that is wasted in the endless search for the perfect document. Two easy fixes are to use both sides of paper and to print only when necessary. Previewing documents electronically and relying on e-mail will make every sheet of paper count.

At minimum, wastepaper should be

Our Contributors: MARY

KATHLEEN FLYNN and BRIAN NADEL are associate editors of *PC Magazine*. OLIVER RIST is a staff writer of *PC Magazine*. SHERYL CANTER is a former associate editor of *PC Magazine* and a free-lance computer writer. CHARLES RODRIGUEZ was the project leader in charge of this story.

Ergonomically designed for Windows.

WinBook, the first notebook computer designed specifically for Windows.

The new WinBook™ gives you all the power to run Windows, and the unique design to make it easier to use.

It features a built-in, centered trackball, which allows you to control cursor movements effortlessly with either thumb—without having to lift a single finger off the keyboard.

And the WinBook comes with the power and speed needed to run Windows effectively. You get 4MB of memory, the new ultrafast 486 SLC/E 25-MHz processor and the Motorola chipset which provides eight power-saving features, even while running Windows.

The WinBook was engineered for Micro Electronics, a division of MEI/Micro Center, Inc. MEI is America's

leading direct source for computer accessories. Micro Center has been selling PCs for more than 14 years—longer than IBM or Compaq—with over 736,000 units sold. And with over 2.2 million satisfied customers nationwide, they have developed a superior support staff, including top engineers and technical specialists. So you always get the highest quality product at the lowest possible price.

Before you choose a notebook computer, look at the only one designed for Windows.

The WinBook from Micro Electronics

—putting Windows at your fingertips.

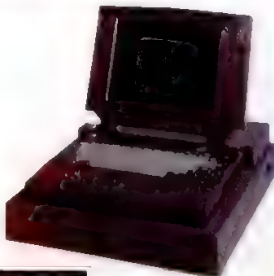
The 5.4 lb. WinBook was designed by award-winning Palo Alto Design.

- Fast-acting Hitachi LCD screen for no cursor loss.
- 512k video RAM for simultaneous display.
- Includes a 9600 baud send/4800 baud receive fax/2400 baud modem.
- Industry standard PCMCIA 2.0 slot for future expandability.



Eight Power-Saving Features

Including sleep mode for all I/O ports, HDD, and FDD to increase battery life.



Docking Station

With the available docking station, your WinBook instantly becomes a full-function desktop computer. Its two expansion slots allow you to add peripherals such as monitors, hard drives, CD ROMs or an extended keyboard. And it's just \$399!

Specifications

Size/Weight

- 11" x 8 3/4" x 1 3/4"
- 5.4 lbs with battery

Pointing Device

- 16mm Alps dual-action, Microsoft compatible internal trackball

Battery

- 4 hours under normal usage
- Sanyo NiMH (no memory effect) 2300 MA with gold-plated contacts
- Worldwide auto-sensing AC adapter
- Quick 2-hour recharge

Power Management

- 8 power-saving features

Processor & Memory

- 486 SLC/E-25 CPU
- 4 MB RAM
- 1 MB ROM for Ami BIOS
- Motorola chipset & Cirrus VGA 6420
- 1k Internal Cache

Drives

- One built-in 1.44 MB 3.5" floppy drive
- Internal 120 MB (15ms) hard drive
- 250 MB (15ms) hard drive optional

Software

- Comes loaded with MS-DOS 5.0 and Microsoft Windows 3.1

Display

- Super-twisted 64 gray scale, 10" LCD with CCFT-backlit
- 640x480 VGA resolution for LCD and 1024x768 for external monitor with 512k simultaneous display
- Adjustable contrast and brightness
- Visible LED indicator on cover-down

Keyboard

- Full-function keyboard with 85 keys and 4 inverted-T cursor control keys, 3.0 mm keyboard spacing

Modem

- Fax-9600 baud send/4800 baud receive/2400 baud modem

I/O Ports

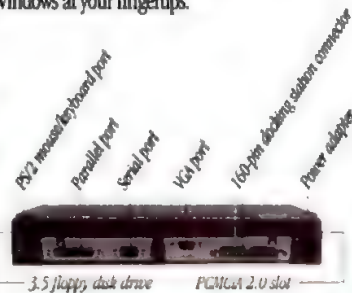
- PCMCIA 2.0 slot
- Serial 9-pin connector
- Parallel port
- Video 15-pin connector for CRT
- 160-pin docking station
- PS/2 mouse interface/keyboard interface

Options

- 250 MB (15ms) hard drive
- 8 MB RAM
- Coprocessor
- Docking station

CIRCLE 085 ON READER SERVICE CARD

No-risk, 45-day unconditional money-back guarantee.



Longer Battery Life

The WinBook features NiMH 2300 MA batteries with gold-plated contacts. This allows it to run much longer than units with traditional NiCAD batteries—and there's no memory effect.

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- One year limited warranty on parts and service

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■ Four Steps to the Healthy Office

by Oliver Rist

The keys to creating a healthful workstation are forethought, adjustability, and common sense. To avoid causing health problems, buy hardware that is ergonomically designed—low-emission nonglare monitors, keyboards and pointing devices with attached or built-in wrist support, and so forth—and place it on and around furniture that can be adjusted as much and as closely

as possible to meet the physical requirements of its user.

Remember to think ahead; if you're in the process of remodeling the office anyway, why not look into repositioning both the data and the electrical cable outlets in each office or cube for optimal synergy with the furniture? You also might look into the possibility of installing indirect lighting or installing antiglare screens on older

monitors. You might also get your local PC guru to configure a display to maximize output video at a flicker-free 72-Hz refresh rate, especially if everybody in the office is running Windows with a white background.

Make sure that all of the employees who constantly work in front of a monitor regularly take a break from their work—about 5 minutes an hour is best. □

MONITOR

The top of your screen should be no higher than eye level, and your head and keyboard should be a little more than 2 feet away from the screen. The display base should allow at least a tilt/swivel kind of adjustment; an additional elevation control is desirable.

LIGHTING

Use a reading lamp for close work. For general illumination, use indirect light, which is reflected off walls or ceilings; it is less likely than direct light to cause glare on monitor screen.

KEYBOARD ADJUSTMENT

The keyboard height should be from 23 to 28 1/2 inches above the floor. To avoid muscle injury, your arms should point straight down from the shoulders and then bend into right angles at the elbows. If your keyboard is too close to allow safe viewing of your CRT, get a keyboard extender cable. Use a wrist rest to prevent sore hand muscles and carpal tunnel syndrome.

SEAT

The chair's seat height should be adjustable between 14 and 20 inches. Your hips and knees should bend at right angles, and your feet should both rest flat on the floor. The chair back also needs to be adjustable, up/down and backward/forward, for optimal lumbar support.





Does Your Keyboard Speak...

...Windows?



The Key Tronic TRAK101™ keyboard offers all the features of an enhanced 101-key layout with the added power of an integrated trackball that's customizable for ease of use and enhanced productivity. The TRAK101 is *the* keyboard for Windows.

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The KB101 PLUS™ keyboard from Key Tronic offers all the features of an enhanced 101-key layout with the added benefits of larger backspace and return keys. The KB101 PLUS features high performance capacitance switch technology, double-shot molded keycaps and a durable enclosure.

...Macros?



The FLASH101™ keyboard from Key Tronic offers unique styling, all of the features of an enhanced 101-key layout, plus the added power of on-screen programmability. The FLASH101 lets you quickly preview function keys, macros and other programmed keystrokes right on your CRT.

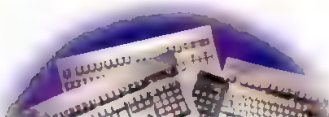
...Spreadsheets?



The ABACUS™ on-line keypad from Key Tronic offers a uniquely functional and dramatically styled keypad that has been designed with calculator functions, F-key references (Mac version only), page control functions (PC version only) and a *Send Key*™ that pastes calculations directly into your text or spreadsheet.

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Key Tronic
MADE IN THE U.S.A.

recycled. The problem with recycling is that it is often difficult to find ways to economically collect and sort wastepaper. Large offices generally have taken the lead in collecting wastepaper for recycling, and many communities now mandate recycling for paper and other consumables.

The PC also offers recycling opportunities. Again, the problem is efficient sorting, complicated by the many different materials contained in the box. IBM's Energy Saver goes against the grain by being made of a recyclable thermoplastic and by not using any metal cross bars. It snaps apart for easy disassembly.

Toner cartridges for laser printers are of great concern. Some companies, such as Canon, Qume, and others that produce laser printers, offer to recycle used toner cartridges, but only a fraction ever get returned for remanufacturing.

Why not attempt to eliminate laser printer throwaways altogether? In spite of its long-winded name, the Kyocera Ecosys a-Si FS-1500A is a lean machine.

Cumulative stress traumas, especially those concerning repetitive-motion injuries to the wrist, are the fastest-growing category of worker compensation claims.

The \$2,395 laser printer uses an amorphous silicon engine that will last the expected life of the printer, which eliminates the need to replace drum units; all you add is toner. A winner of *PC Magazine's* Award for Technical Excellence in 1992, the printer reduces the average cost per page of printing to less than 1 cent, versus 3 cents for conventional laser printers that use lots of consumables that

How IBM's Green PC Compares on Power Use

By combining a liquid crystal display and low-power CPU, the IBM Energy Saver system reduces power consumption by 75 percent.



	IBM Energy Saver	Average PC
CPU voltage	3.3 volts	5 volts
Base unit power use	16 watts	77 watts
Monitor	SVGA active-matrix liquid crystal display	SVGA cathode ray tube
Monitor power use	20 watts	85 watts
Total power use	36 watts	162 watts

eventually make their way to landfills.

Recycling can have more of an impact when applied to batteries, which, if they are the nickel cadmium type, contain cadmium, a toxic heavy metal that should never reach a garbage landfill. So far, Compaq is one of the few companies that offer to recycle batteries. It is too early to gauge the popularity of this idea, but response to the program has grown from 30 batteries per month when it started early in 1992 to 300 cells per month now. The nickel is used in stainless steel products. While nickel cadmium batteries will likely be replaced in the portable market by more powerful nickel-metal-hydride and eventually lithium cells, this change-over is in the future.

Even software companies are getting into the recycling act. GreenDisk, based in Redmond, Washington, takes outdated software packages off the shelves and recycles the disks. Manuals and other printed material are returned to the vendor, and the disks are magnetically wiped clean, reformatted, and sold to corporate accounts. GreenDisk plans to sell recycled disks to PC users soon. But you don't have to wait for boxes of recycled disks to turn up in your local store. An economical as well as ecologically sensible solution is to take that pile of floppies containing previous-generation programs or data that is no longer relevant and reformat them yourself. All you'll need is a little time and some new labels.

The PC industry uses a large amount of packaging material to cushion the

bumps and shocks inherent in shipping, providing a big opportunity for waste reduction. From cardboard boxes to plastic peanuts, all of this material becomes garbage after a remarkably short useful life. A suggestion is for manufacturers to accept return of packing materials for reuse, as shipping companies accept foam peanuts. Hewlett-Packard found it could save \$3 million a year by using unbleached kraft cardboard boxes. On top of the savings, compared to white boxes, using brown boxes spares the environment the chemical wastes used in bleaching.

While assembling PC systems is environmentally clean, some of the processes that make semiconductors, hard disks, and other components aren't. From the prevalent use of chlorinated solvents to the use of hydrofluoric acid to etch the tiny patterns on chips, hardware production has its nasty aspects. One area of improvement is the decreasing use of chlorofluorocarbons (CFCs) as solvents. These long-lived molecules slowly travel into the upper reaches of the atmosphere, where they can deplete the earth's ozone layer. Now Intel, Apple, Compaq, and others have moved to a clean "no-wash" manufacturing process that eliminates the use of CFCs. There is an economic motive here: CFCs are a heavily taxed chemical that, if eliminated, will lower production costs.

PAIN IN THE WRIST

Whether it is for causing lower-back pain, causing a sore wrist, or causing headaches, the PC has taken a lot of heat lately. For anyone who spends long hours working on a PC, ergonomics can be a serious health issue. At stake is more than comfort and convenience: Cumulative stress traumas, especially those concerning repetitive-motion injuries to the wrist, are the fastest-growing category of worker compensation claims.

Perhaps the commonest computer-related ailment is the sore wrist. Jab too long at your keyboard or grasp the mouse without support and the delicate muscles in your hand and wrist may become

**We won the awards.
But you get the prize.**

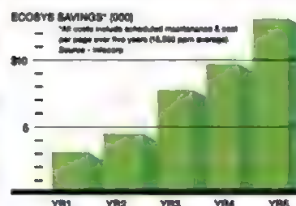


It's official! The unbeatable cost savings, unparalleled productivity and environmental safety of the ECOSYS FS-1500A 10 page per minute network printer has earned it the industry's most coveted awards.

Now, Kyocera introduces another winner. The ECOSYS FS-3500A 18ppm network printer.

Savings so high ... Ecosys pays for itself.

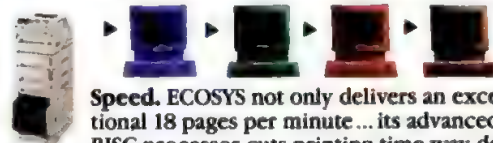
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■ Ergonomics of Input

by Mary Kathleen Flynn

Choosing an input device used to be relatively painless, due to the limited options available. Most users chose a keyboard based on the 101-key layout, and the only passionate debate centered around whether you preferred "mushy" or "clicky" keys. Deciding whether you wanted a mouse or a trackball may have been a more emotional decision, but even that contest had a clear winner. The vast majority of people chose a mouse, and most of them picked the same one: Microsoft's.

But over the last year, input devices have become much more controversial, and many have also taken on a new look. The number of users suffering from stress-related injuries such as carpal tunnel syndrome, for example, has grown—as has the number of lawsuits.

Device makers have responded by paying close attention to comfort and



ergonomic issues. Several companies—most notably, Lexmark International, Logitech, and Microsoft—have conducted extensive usability studies. The result of those studies is a new wave of input devices designed to be more comfortable to use and also more customizable—although nobody will go so far as to say the new designs will cause fewer injuries. □

MICE GET LONGER

The keyboard wasn't the only input device to get an overhaul this year. Ignoring the maxim "If it ain't broke, don't fix it," Microsoft recently reworked the most popular nonkeyboard input device in the world: the mouse. The Microsoft Mouse 2.0, which retails for \$125, designed after the company considered mounds of ergonomic research, is slightly longer than its Dove bar-shaped predecessor; it curves and slopes to fit the hand better, and the buttons are larger (see *First Looks*, this issue). Logitech (800-231-7717), long an advocate of the feels-better approach to ergonomics, has also elongated the standard mouse shape in its new MouseMan Cordless II, which retails for \$169, as has Apple in its Apple Desktop Bus Mouse II for Macintosh computers, which retails for \$79.

KEYBOARDS COME APART

Keyboards have outwardly changed dramatically: Now they come apart—on purpose. Current thinking has it that splitting the right and left halves of the keyboard while retaining the original QWERTY layout creates a more natural position for the hands (*Trends*, March 30, 1993). Some keyboards, such as Marquardt Switches' \$179 Model 7053 (315-655-8050), leave it at separating the two halves and resetting them at about a 20-degree angle. Others, such as Apple's \$219 Adjustable Keyboard (which currently works only with Apple computers) and Health Care Keyboard Co.'s \$675 Comfort Keyboard System (414-253-4131), allow users to pull apart the two halves and reconfigure them in the most comfortable position.



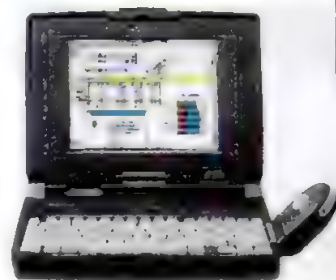
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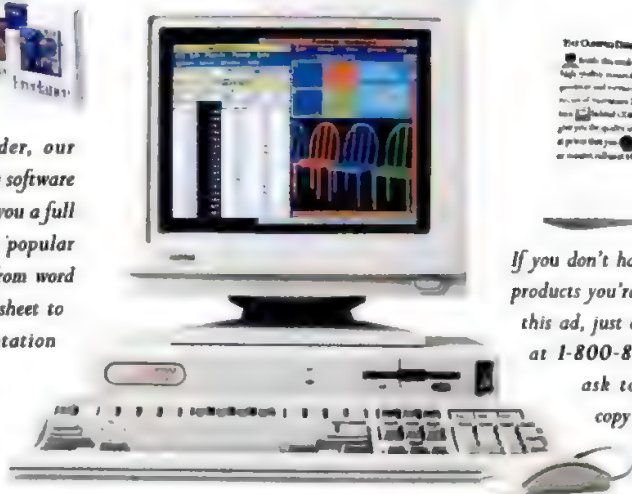


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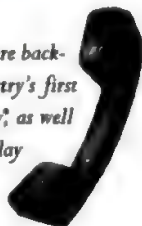
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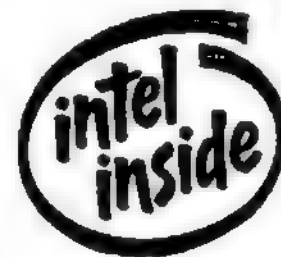
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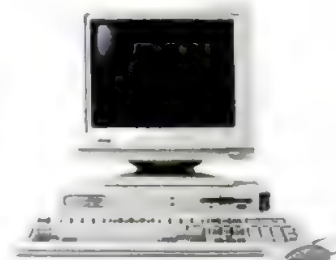
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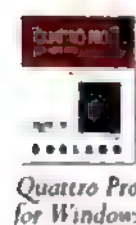
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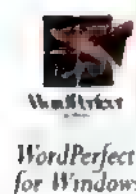
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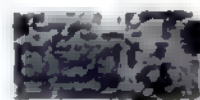
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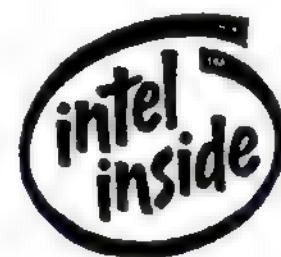
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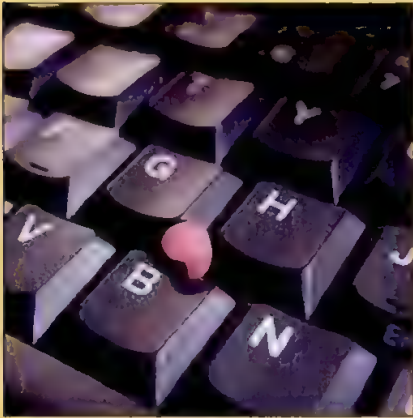
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Ergonomics of Input

CONTINUED



THE ERASER

Perhaps the most innovative idea in portable pointers is the IBM PS/2 TrackPoint II, a pointing stick developed by IBM and Lexmark that is built into the keyboard of IBM's ThinkPad 700 notebook line. Known as the "eraser" for obvious reasons, the red rubber pointing stick uses a strain-gauge to turn finger pressure into direction and speed for the on-screen arrow pointer.



TRACKBALL COMEBACK?

Although trackball makers such as MicroSpeed have argued for years that their products are more comfortable to use than traditional mice, customers have voted their preference by choosing mice over trackballs by ten to one. But the growing popularity of portable computers has breathed new life into the trackball. Even Microsoft turned to the trackball when it entered the market for portable pointing devices with its snap-on BallPoint Mouse that doesn't use clumsy wires to connect to the laptop. MicroSpeed's \$89 MicroTRAC Trackball (800-232-7888) and Mouse Systems' \$99.95 PC Trackball II (510-656-1117) are two of the newest mini-trackballs. They quickly and easily hook on to laptops and aren't as bulky as their predecessors.



POINTING THE WAY

The limited real estate available on portable computers has prompted manufacturers to design and build trackballs integrated into either the keyboard or the portable's case. Lexmark International includes a 16-mm trackball on the keyboard of notebooks it sells to other PC makers. The scheme worked so well on portables that Lexmark and IBM took the same approach with desktop keyboards. The IBM Enhanced 101 Key Keyboard is built around its standard keyboard, but includes a 25-mm trackball. Key Tronic's (509-928-8000) TrakMate goes a step further by combining a keyboard-width wrist rest with a 33-mm trackball. Actuation buttons around the ball can be used to adjust the trackball's sensitivity.

■ Friendly Furniture

by Sheryl Canter

Anything done to excess can threaten your health, and sitting in front of a computer is one of those things that people tend to do to excess. Carefully designed furniture that combats the stress of PC work is now available from Forminco, based in Brossard, Quebec. The key to the furniture's friendliness is its adaptability in all areas, from the height of a monitor to the position of a keyboard and mouse pad to use by a multitude of users and body types.

The \$25 flying saucer-like mouse pad, called Mouse Arena, sits on its own adjustable arm. According to Forminco's designer, palm support rather than wrist support is important to prevent carpal tunnel syndrome.

The company's chair has an adjustable, velcro-attached leather cushion for lumbar support, and seat depth can

be adjusted as much as four inches. An optional foot rest, available in either vibrating or nonvibrating versions, can further ease tension.

Anyone who wears bifocals understands that repeatedly tipping your head back to see the monitor through your lower lenses can cause strain in your neck and shoulders. The specially built bifocal monitor system lets you view the screen through an opening in front of the keyboard. The monitor can be adjusted through pressurized hydraulic cylinders.

Forminco furniture was designed using all currently available ergonomics research, but the setup and fine-tuning of the furniture is best done through trial and error. Forminco furniture is not terribly expensive: The Power Center (workstation shown in photo) with an ergonomic chair and a vibrating foot rest retails for \$947. □

inflamed. That pushes muscle tissues against the median nerve, which passes through the narrow passage in your wrist called the carpal tunnel. If left untreated, the result can be carpal tunnel syndrome, which manifests itself as pressure, pain, and sometimes loss of hand function. It afflicts some 230,000 workers annually, and the medical bill for treating carpal tunnel syndrome is high: \$805 million per year, according to National Institute for Occupational Health figures.

Fortunately, this is an avoidable malady. The main thing is to interrupt your work frequently and exercise the affected muscles. A short break every hour could be the difference between freedom of movement and pain. If you're too obsessed with your work to take breaks, try letting your PC determine your routine. User Friendly Exercises, distributed by PM Ware (800-845-4843) will time exercise intervals and instruct you in the proper stretching, prodding, and rubbing for pain-free hands. The program costs \$59.95, and at preset intervals urges an exercise break. The enforced breaks can be annoying, but they are a necessary evil to keep fingers limber.

PROMISING KEYBOARDS

New keyboard designs promise—but often fail to deliver—dramatic improvements over the standard layout derived from nineteenth-century typewriter design. The range today is stunning, from keyboards that look like miniature spaceships to mildly reconfigured standard keyboards. While some, such as the Kinesis and Marquardt boards (see "Ergonomics of Input"), attempt to place the hands in a more natural position, the most useful keyboards are those that combine familiarity with comfort. With an industry centered on the weird and wacky, the Erase-Eaze keyboard from Keyboard Advances Inc. (515-472-0353) is a welcome change. From a distance it appears run-of-the-mill in all aspects, but on closer inspection you'll see that the Spacebar has been split into two keys: one for the Spacebar, the other for an extra Backspace key. Erase-Eaze is a time saver as well as a wrist saver because it keeps you from reaching over to the extreme right where the regular backspace key resides. With many specialized



The Forminco Power Center, with an ergonomically designed chair, vibrating foot rest, and mouse pad, retails for \$947.

A Look Behind the Screen

by Brian Nadel

The ubiquitous monitors that grace our desks are starting to take on a decidedly green tint these days. While the basic design of a cathode ray tube has changed little over the years—a gun in the back of an evacuated glass funnel projects a beam of electrons onto the inside of the tube, which is coated with a layer of phosphors—the world's monitor makers have innovative solutions to the twin problems of prodigious electricity use and electromagnetic radiation emissions.

The source of electromagnetic radiation is the deflection coils on the tube's yoke that are used to direct the electron beam; they create fields that can leak out of the monitor housing. Engineers have been successful in using a smaller cancellation coil to counteract the deflection coil's magnetic field (see illustration at right). The two fields oppose each other (note the direction of the arrowheads), canceling each other. The result is lower emissions.

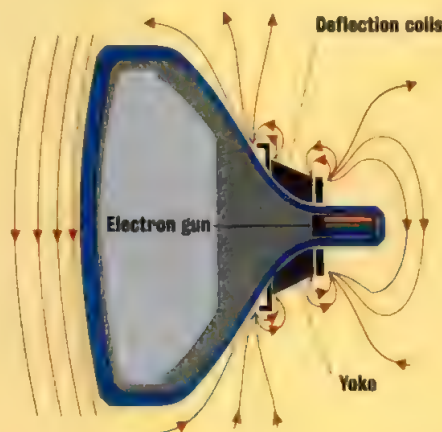
A monitor displaying complicated graphics consumes a lot of power—regardless of whether anybody is actually looking at it. Environmental Protection Agency surveys show that 80 percent of the time, monitors play to an empty

room or cubicle. Nanao USA Corp.'s solution is to put the monitor to sleep in a succession of power-saving stages. The trigger is the PC's screen saver, set on blank-screen mode, which tells the monitor when no computing is going on. The first stage is the screen saver; power use drops by 20 percent because no image is being formed on the screen. After three minutes, the Power Saver stage starts, in which a proprietary Nanao microprocessor sends just enough electricity through the monitor's tube and circuitry to keep them warm; this reduces power use by 90 percent. The onset of the final stage, which is called Power Down and can be set to last up to an hour, cuts power

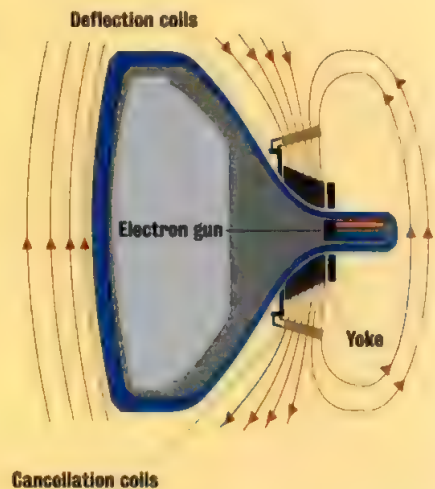
usage down to only the amount necessary to keep the processor running. When you're ready to wake the monitor, just hit a key and the monitor will respond in about five seconds.

Power consumption of a Nanao F760iW 17-inch monitor we tested went from 140 watts at full operation to only 11 watts at the Power Down stage. Keiichi Makino, Nanao's vice-president, said that this process not only helps the environment and saves on electrical bills, but reduces an office's cooling needs. Pointing the way toward further reduction of power use, he added, "Power savings of this level is not a hard thing to accomplish, but it is a start." □

Standard CRT design



Low-emission CRT design



keyboards costing upwards of \$700, the Erase-Eaze has been designated to sell for no more than a standard keyboard.

When setting up a computerized office, adjustability of furniture and hardware is crucial. A few rules of thumb are important: The tops of most desks are 30 inches from the floor—much higher than they should be. Depending on your height, your keyboard should be between 23 inches and 28.5 inches above the floor.

A good solution is to sacrifice your desk's pencil drawer and install a pull-out keyboard tray. For optimal hand position, you're best off with the thinnest keyboard you can get. A good example is Marquardt Switches' MiniBoard (800-282-3746), which incorporates standard-key sizing into a low-profile format about half an inch thinner than conventional keyboards and occupies about half the desktop real estate as a conventional key-

board. However, you sacrifice the numeric pad, and the ergonomic downside is that a flat keyboard can make reading keys difficult, due to light reflection.

Some of the biggest payoffs can come from tiny practical investments: a wrist rest or back pad for your chair. A foot rest might help back pain. Get rid of the turned-over milk crate, though. The MicroComputer Accessories Comfort-

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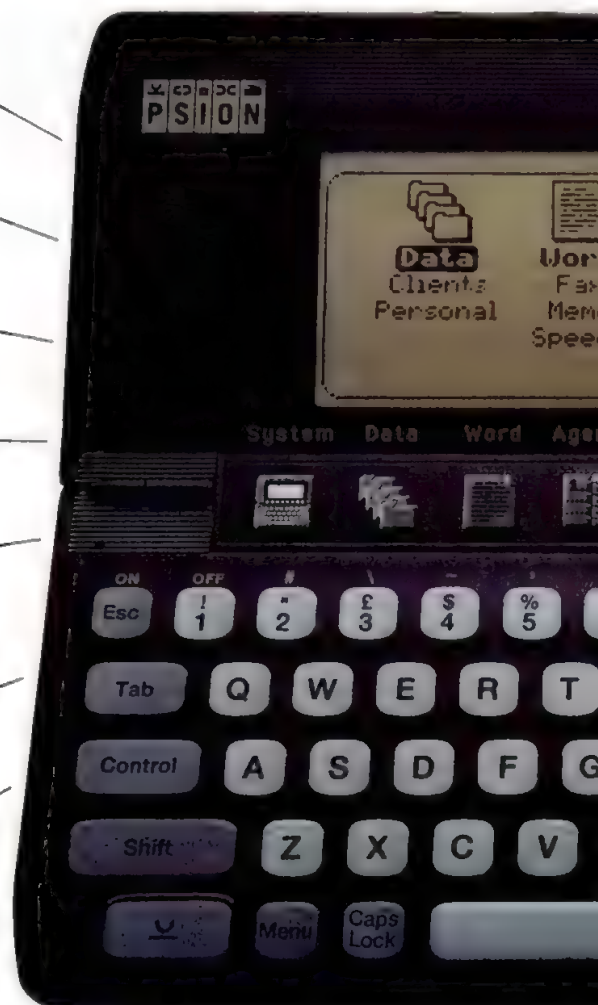
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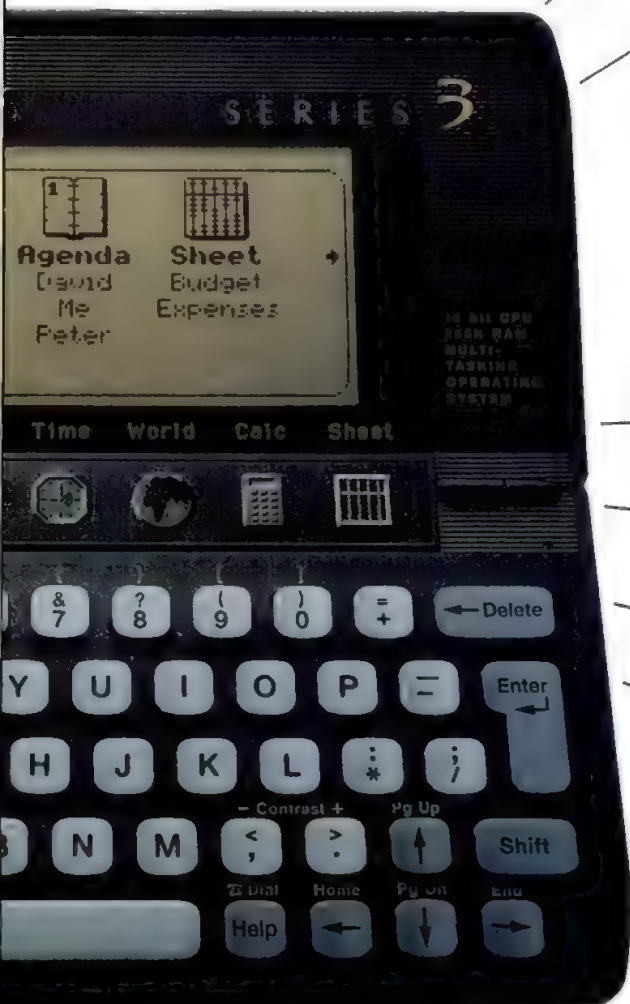
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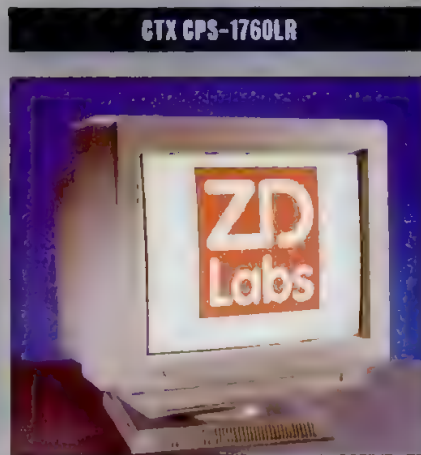
How We Tested: Monitors

ZD Labs tested ten monitors for compliance with the MPR II electromagnetic emissions standard, established in 1990 by the Swedish National Board for Measurement and Testing to provide a basis of comparison among monitors in terms of electromagnetic emissions.

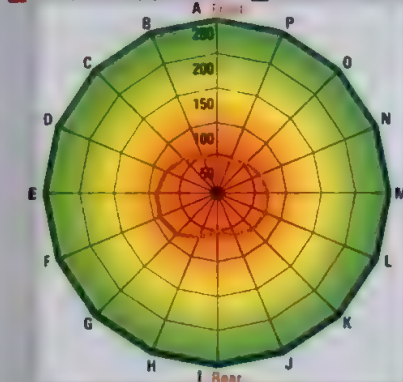
Each monitor was placed on a rotating table, and its characteristic pattern of emission was recorded at 48 points in Band 1 (5 Hz to 2 kHz) and 48 points in Band 2 (2 kHz to 400 kHz). Then 16 measurements were made at each of three positions at a distance of half a meter (just under 20 inches), each 22.5 degrees apart. First, the magnetic field meter was aligned directly with the center of the monitor, then the measurements were repeated with the instrument half a meter above and below the monitor's center.

To pass the MPR II test, a monitor could not emit more than 250 nt (nanoteslas) of electromagnetic radiation within the range tested at half a meter away. All but the Radius PrecisionColor Display/19 fell within the MPR II guidelines for emissions. These radar charts present a top view of each monitor and illustrate the Band 1/Position 2 emission pattern. The tighter the band, the lower the radiation. Note that most of the radiation pattern is distributed on either side of a monitor, not in front.

Unfortunately, not enough statistical data exists regarding safe emission levels; the MPR II guidelines give just a measuring tool to go by and not the final answer. All scientists and doctors agree on is that lower emissions are safer.



Band 1/Position 2 (nt) MPR II Guidelines (250 nt)



The CPS-1760LR met MPR II standards and was rated as having above-average clarity and sharpness.

CTX International Inc., 20530 Earlgate St.,
Walnut, CA 91789; 800-289-2189,
909-595-6146; fax, 909-595-6293

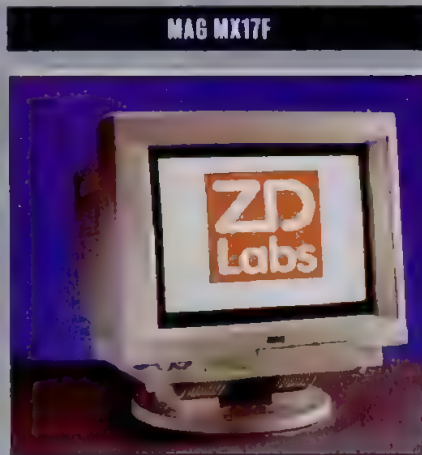
List price: \$1,399.

Tube size (diagonal): 17 inches

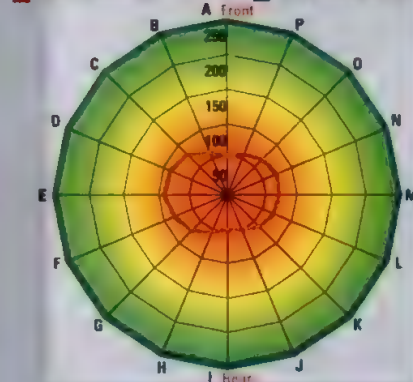
Viewing area (diagonal): 16.5 inches

Maximum resolution: 1,280 by 1,024

Maximum vertical refresh rate: 90 Hz



Band 1/Position 2 (nt) MPR II Guidelines (250 nt)



The MX17F monitor met MPR II radiation standards and was rated well-below-average in image clarity and sharpness.

MAG InnoVision Inc., 4392 Corporate
Center Dr., Los Alamitos, CA 90720; 800-
827-3998, 714-827-3998; fax, 714-827-5522

List price: \$1,499.

Tube size (diagonal): 17 inches

Viewing area (diagonal): 15.5 inches

Maximum resolution: 1,280 by 1,024

Maximum vertical refresh rate: 120 Hz



Tread (800-521-8270) is a \$29.95 foot rest with a surface covered with half-dollar-sized hemispheres that gently massage the unshod foot. Anyone obliged to input data from paper documents will want a copy holder that keeps the papers on the same horizontal level as the monitor's screen. This reduces stress in neck, shoulder, and eye muscles. Where lighting problems can't be adjusted away, anti-glare screens can help. Another way to

put together an ergonomically friendly office is to do it in the one-stop-shopping approach that yields an office with an integrated look and feel (see "Friendly Furniture").

Monitors are the other main point of interface between human and machine. The typical PC user spends 200 to 2,000 hours per year staring into that screen. If it flickers, if the on-screen characters aren't sharply defined, or if the images

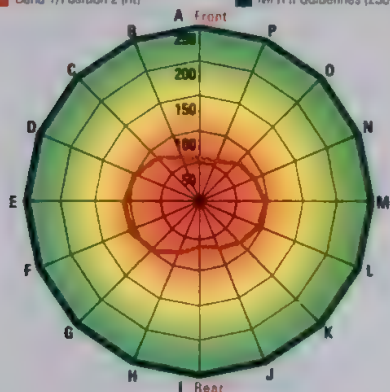
are distorted, eyestrain, headaches, and lost productivity are inevitable. A few tips will help in choosing your next monitor: In general, bigger monitors cause less eyestrain than smaller ones, particularly in graphics-intensive applications. More colors usually translate into clearer images. Smaller dot pitches—closer to 0.26 than to 0.51 millimeters—are easier on the eyes. Follow the VESA specifications, which establish a minimum vertical

COVER STORY
Green Machine

Nanao F550I



Band 1/Position 2 (nt) MPR II Guidelines (250 nt)



The Nanao F550I met MPR II standards and offered clarity and sharpness that was well-above-average.

Nanao USA Corp., 23535 Telo Ave.,
Torrance, CA 90505; 800-800-5202,
310-325-5202; fax, 310-530-1679

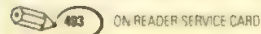
List price: \$1,499

Tube size (diagonal): 17 inches

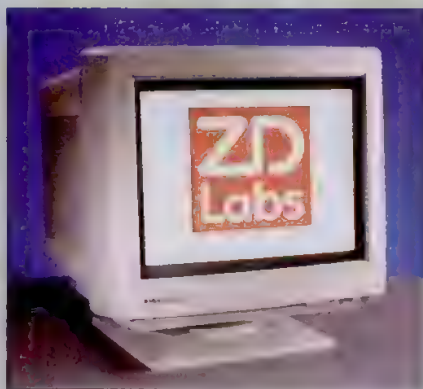
Viewing area (diagonal): 16 inches

Maximum resolution: 1,280 by 1,024

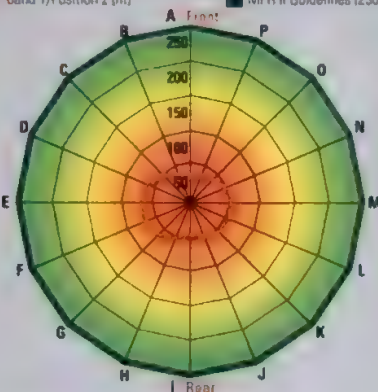
Maximum vertical refresh rate: 90 Hz



Nanao T560I



Band 1/Position 2 (nt) MPR II Guidelines (250 nt)



The outstanding performer in clarity and sharpness was the Nanao T560I monitor. It also met all the MPR II standards.

Nanao USA Corp., 23535 Telo Ave.,
Torrance, CA 90505; 800-800-5202,
310-325-5202; fax, 310-530-1679

List price: \$2,199

Tube size (diagonal): 17 inches

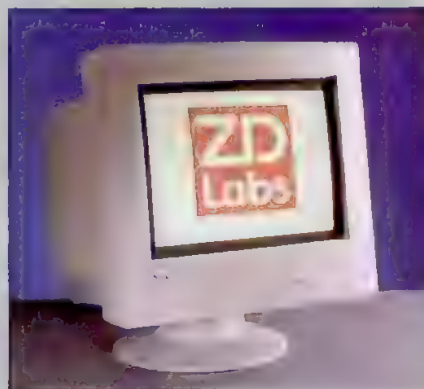
Viewing area (diagonal): 16.25 inches

Maximum resolution: 1,280 by 1,024

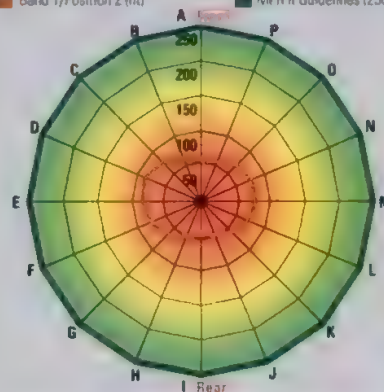
Maximum vertical refresh rate: 90 Hz



NEC MultiSync 5FG



Band 1/Position 2 (nt) MPR II Guidelines (250 nt)



The 5FG had above-average clarity and sharpness and met the MPR II standards for monitor emissions.

NEC Technologies Inc., 1255 Michael Dr.,
Wood Dale, IL 60191; 800-388-8888,
508-264-8000; fax, 800-366-0476

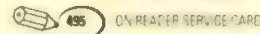
List price: \$1,355

Tube size (diagonal): 17 inches

Viewing area (diagonal): 15.75 inches

Maximum resolution: 1,280 by 1,024

Maximum vertical refresh rate: 90 Hz



refresh rate of 72 Hz at 800-by-600 resolution and 70 Hz at 1,024-by-768 resolution.

Make the most of what you've got by periodically testing the monitors' character resolution, distortion and other technical characteristics with Sonera Technologies' DisplayMate (\$149, 800-932-6323), a suite of 200 video tests and 100 diagnostic tests. The software enables users to correctly adjust the manual con-

trols on their monitors. Be warned, some older monitors may not have all the adjustment capabilities you'll need.

SIGHT FOR SORE EYES

Eyestrain is annoying, but electromagnetic emissions from monitors may pose a serious health risk. Although a causal connection between emissions and illness has not been proved, statistical studies suggests a connection. Most current

research shows that if there is a danger, it is greatest near big electrical power lines—but emissions of both electrical and magnetic radiation from ordinary PC monitors are high enough to cause concern.

In 1987, Sweden's National Board for Industrial and Technical Development developed the first monitor-radiation standard. It was updated in 1990, resulting in what is generically known as MPR

There have been numerous press articles recently about 'repetitive motion' injuries.

The problem is significant and will probably instigate a growing volume of federal and local legislation regulating workstation design and rest periods for operators.

Logitech can help.

We make computer mice, and more of them than any other company.

Mice not only make computing easier and faster but, when correctly shaped for an individual's hand, they reduce the risk of repetitive

Are PC Users Working Th



motion injuries.⁽¹⁾

Working closely with industrial designers, medical

and ergonomics researchers, and consumer testers, we've developed mice that are more

1 Based on research by World Health Org., US Dept. of Health and Human Services, Logitech, and others.

Put Your Fingers To The Bone?



comfortable in more types of
hands (left and right) than
any other brand. And their

shape, weight, sensitivity and
three-button programmability
minimize user effort.⁽¹⁾

Available for IBM® and com-
patible personal computers
and the Apple Macintosh®,
each mouse carries a lifetime
warranty and software com-
patibility guarantee. Try them
where you see our hands-on
dealer display, and feel the
difference a truly ergonomic
mouse can make. Logitech
mice are available at computer
and retail outlets worldwide.

For more information, call
1-800-732-3082.

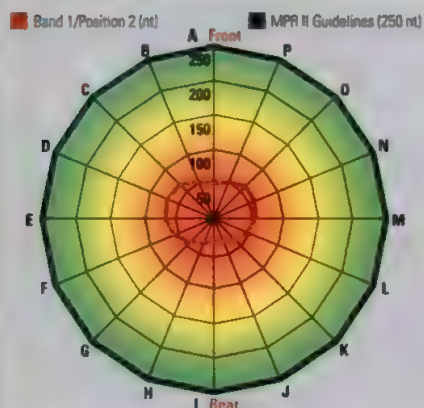


The Senseware™ Company

CIRCLE 182 ON READER SERVICE CARD

2 Suggested by the American Nat. Standard for Human Factors Engineering. ®/TM - trademarks are the property of their respective owners.

Radius PrecisionColor Pivot



Although the PrecisionColor Pivot had only average clarity and sharpness, Radius had high-quality documentation. It met MPR II standards.

Radius Inc., 1710 Fortune Dr., San Jose,
CA 95131; 800-227-2795, 408-434-1010;
fax, 800-966-7360

List price: \$1,149

Tube size (diagonal): 15 inches

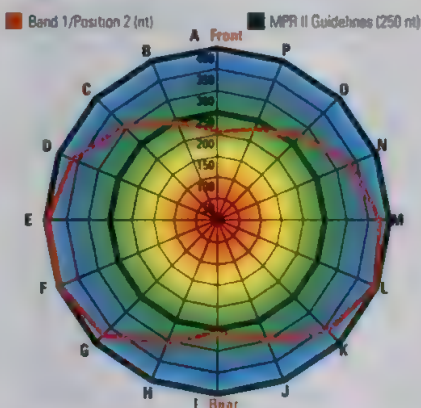
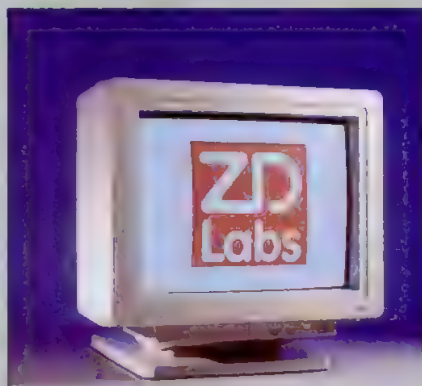
Viewing area (diagonal): 13.75 inches

Maximum resolution: 1,024 by 768

Maximum vertical refresh rate: 90 Hz



Radius PrecisionColor Display/19



Well below average in clarity and sharpness, the PrecisionColor Display/19 also failed to meet MPR II standards.

Radius Inc., 1710 Fortune Dr., San Jose,
CA 95131; 800-227-2795, 408-434-1010;
fax, 800-966-7360

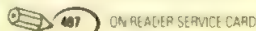
List price: \$2,499

Tube size (diagonal): 19 inches

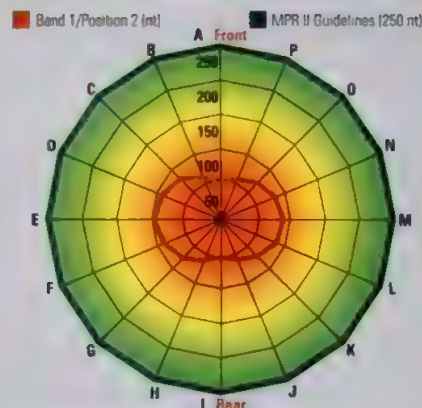
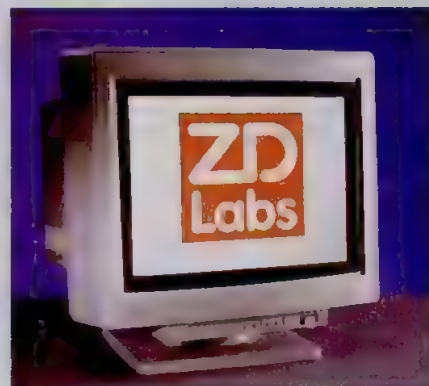
Viewing area (diagonal): 19 inches

Maximum resolution: 1,024 by 768

Maximum vertical refresh rate: 72 Hz



Radius IntelliColor Display/20



The IntelliColor Display/20 was rated above-average in clarity and sharpness, but ran hot, at 107 degrees Fahrenheit. It met MPR II standards.

Radius Inc., 1710 Fortune Dr., San Jose,
CA 95131; 800-227-2795, 408-434-1010;
fax, 800-966-7360

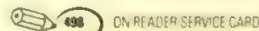
List price: \$3,199

Tube size (diagonal): 20 inches

Viewing area (diagonal): 19.5 inches

Maximum resolution: 1,280 by 1,024

Maximum vertical refresh rate: 120 Hz



II. While these standards fall short of a reliable guarantee of safety, for now, they are the best guidelines around.

ZD Labs tested 11 color super VGA (SVGA) monitors that are a mixture of pre-MPR II and newer products. Only one of the monitors, the Radius PrecisionColor Display/19, failed to meet the Swedish standard. To judge the subjective aspects of image quality, we impanelled a jury of three people (the Sony

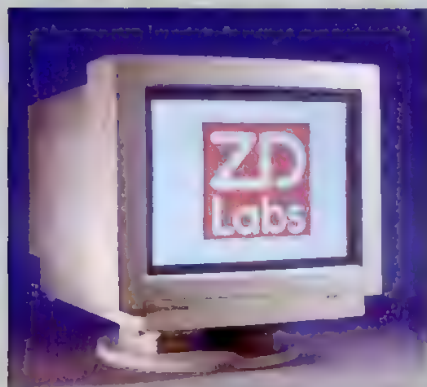
CPD-1730 monitor arrived too late for this test). Jurors viewed each of the monitors on a standard test-bed and rated the Nanao T560i and the NEC 5FG as superior. Since you can get an MPR II-compliant monitor for a competitive price without sacrificing image quality, why buy anything else?

If you have an older monitor and are interested in retrofitting it, the emissions can be shielded with metal or conductive

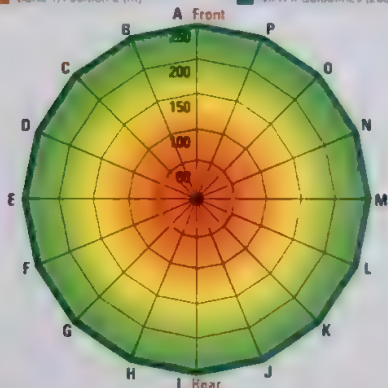
materials inside or on top of the housing, plus a screen in front of the picture tube. Shielding works best at its source. We continued our monitor testing by seeing if we could bring the Radius monitor that failed our MPR II testing into compliance—short of rewiring the monitor. Based on our tests, a set of add-on products from NoRad Corp. (800-262-3260) brought the errant monitor into compliance. The NoRad ELF ProTech is a pair

COVER STORY
Green Machine

Sigma Ergoview 17



Band 1/Position 2 (nt) MPR II Guidelines (250 nt)



The Ergoview 17 was rated as having well-above-average clarity and sharpness. It met MPR II standards.

Sigma Designs Inc., 47900 Bayside Pkwy.,
Fremont, CA 94538; 800-845-8086,
510-770-0100; fax, 510-770-2640

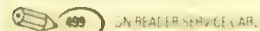
List price: \$1,499

Tube size (diagonal): 17 inches

Viewing area (diagonal): 15.5 inches

Maximum resolution: 1,280 by 1,024

Maximum vertical refresh rate: 120 Hz

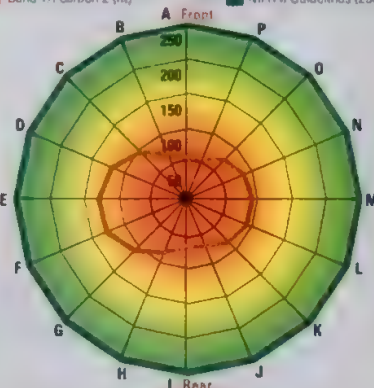


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Sony CPD-1730



Band 1/Position 2 (nt) MPR II Guidelines (250 nt)



The CPD-1730 uses Sony's Trinitron cathode ray tube and meets all MPR II standards for monitor emissions.

Sony Corporation of America, Computer
Peripheral Products Co., 655 River Oaks
Pkwy., San Jose, CA 95134; 800-352-7669

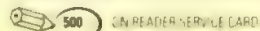
List price: \$1,759.95

Tube size (diagonal): 17 inches

Viewing area (diagonal): 16 inches

Maximum resolution: 1,024 by 768

Maximum vertical refresh rate: 72 Hz

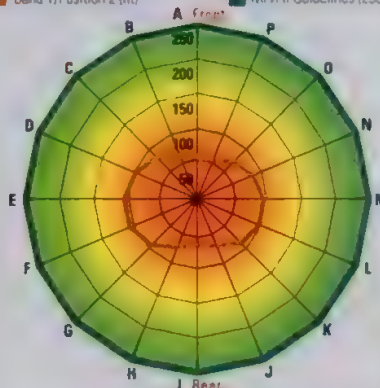


ON READER SERVICE CARD

ViewSonic 17



Band 1/Position 2 (nt) MPR II Guidelines (250 nt)



The ViewSonic 17 was rated as having average image clarity and sharpness and met the MPR II standards.

ViewSonic, 20480 Business Pkwy., Walnut,
CA 91789; 800-888-8583, 909-869-7976;
fax, 909-869-7958

List price: \$1,599

Tube size (diagonal): 17 inches

Viewing area (diagonal): 15.5 inches

Maximum resolution: 1,280 by 1,024

Maximum vertical refresh rate: 90 Hz



ON READER SERVICE CARD

of metal strips that surround the monitor's case, absorbing about one-third of the magnetic field emitted. In addition, an Ultraglass shield from NoRad reduced the emissions still further. NoRad's ELF Protech is priced from \$65 to \$131, depending on size, and the Ultraglass screen cover costs from \$139 to \$249. Taken together, these options for refitting your monitor can be an expensive proposition.

DEEPEST SHADE OF GREEN

Just as the ideal PC is no more than an abstract concept, a truly green computer may not really exist. Every computer will use electricity; the trick will be to reduce energy consumption to the lowest level possible. A good start has been made at addressing the most pressing environmental and health concerns. The advent of low-power systems (with monitors and printers that can go into a low-power

sleep mode) goes a long way to reducing PC energy use. Working toward decreasing monitor emissions and creating an ergonomically friendly office will also help, as will encouraging recycling and cutting down on consumable items.

What will likely come into being is a range of computers, peripherals, and products that take a variety of tacks on these problems, each seeking to exploit a market niche that doesn't exist now. □

All for one? One for all.



Introducing the HP LaserJet 4M.

Now everyone can tap the power and performance of an HP LaserJet printer. The HP LaserJet 4M. A printer made with everything your PC and Mac users expect: built-in genuine PostScript™ Level 2 from Adobe,™ 6 MB of standard memory, standard LocalTalk, optional EtherTalk, built-in Windows TrueType fonts, and

the best 600-dpi print quality available.

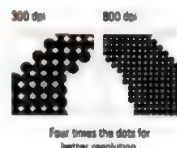
Greater flexibility for mixed environments.

Because it's designed to be shared simultaneously, the LaserJet 4M gives you greater flexibility for mixed environments without compromise to either. Automatic language

switching between PCL 5 and PostScript, 3 hot I/O ports, and new RISC processor make sure no one will have to wait around for this printer.

The finest print quality in its class. With HP's microfine toner, Resolution Enhancement technology, and 600 × 600-dpi engine, the new LaserJet 4M

printer also delivers the finest 600-dpi print quality available.

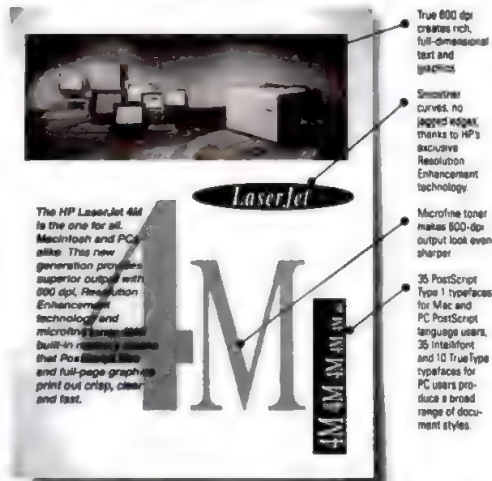


Four times the dots for better resolution.

Its wide range of typefaces, two integrated paper trays, and the options of a 500-sheet tray and a power envelope feeder set a new standard in versatility.

HP quality and reliability. Of course, with the LaserJet 4M printer, you'll enjoy HP's renowned quality and reliability. All for only \$2,399.* So call 1-800-LASERJET (1-800-527-3753), Ext. 7341** for a free print sample.† Or visit your nearest authorized HP dealer.

If it isn't a LaserJet, it's only a laser printer.





NEW WRITERS' TOOLS

Better Writing Through Electricity

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Correct spellings, better words, and pithy quotes—all are available on demand.

by Rubin Rabinovitz

Sorry, your computer still isn't smart enough to write your memoirs while you sit on the veranda savoring a mint julep. But some of the new writers' tools can give you more time for julep sipping by simplifying the tasks of research and revision. Electronic dictionaries, thesauri, grammar checkers, style manuals, quotation dictionaries, and encyclopedias—many of these have shown marked improvements in recent upgrades.

Things are moving quickly enough that some of the pro-

grams we considered state-of-the-art in our last writers' tools roundup ("Write on Target: 15 Writers' Tools," September 24, 1991) are now at the back of the pack; that's why we're looking only at products that have been recently upgraded. As in the last writers' tools roundup, we won't be reviewing spell-checkers: By now, most word processing programs have integrated spell-checkers, and most of them are very good ones. And because we recently published a survey of reference works on CD-ROM (December 22, 1992), we're restricting this story to floppy disk-based programs.



Bigger hard disks, faster chips, and better compression have spurred these vendors to enhance their products.

Roomier hard disks, faster processors, and more efficient compression programs have encouraged developers of writers' tools to enhance their products, and many of these are now available in Windows versions. Where both DOS and Windows versions of programs were available, we focused on the latter; if you have the choice, we think you should, too. Programs that are clunky or kludgy in their DOS versions are miraculously transformed in their Windows metamorphoses: They are more attractive, easier to work with, and free of the ill-mannered behavior of DOS TSRs.

GRAMMAR CHECKERS

If the surgeon general of the United States were regulating software, grammar programs would carry warning labels indicating that they couldn't cure all or even most of the errors in a typical document. Grammar checkers have gotten better, but they're struggling to solve formidable linguistic problems, so it'll be a while before any of them can come close to the accuracy of a human editor. This complexity makes grammar programs hard to test; for example, changing their settings so they become more sensitive to stylistic errors also leads to an increase

in their rate of *false flagging* (reporting nonexistent errors). This is why we've tested all of the grammar checkers reviewed here at the settings recommended by their publishers.

Now that many word processors include integrated grammar checkers, you may be wondering whether it's worth buying a standalone grammar checker to use in conjunction with one you already have. It's true that different programs will find different errors; thus, using two grammar checkers in tandem will produce a better error-detection rate than one could achieve by itself. But of course,

you don't want to buy a second copy of the program you already own. If you're unsure about which grammar checker your word processor uses, you'll find it in a copyright notice in your manual, in a start-up screen, or—for Windows programs—in the About listing you'll find under the help menu.

Some integrated grammar checkers lack the bells and whistles included in their standalone counterparts. For example, Correct Grammar is based on Houghton Mifflin Co.'s CorrecText, the program that's also used in Ami Pro and Microsoft Word for Windows. But unlike CorrecText, Correct Grammar works with any text-producing application, includes more professionally created style guides, and comes with a programming guide for creating custom rules. Even so, all of these advantages aren't really great enough to offset the cost of buying a second grammar checker.

Most grammar checkers come with routines for performing readability tests, such as the Flesch Reading Ease sum-

mary. These tests shouldn't always be taken seriously: They use simple statistical measures that often result in vague or misleading advice. One of them, for example, gave us praise for the unencumbered style of a spelling list.

DICTIONARIES

The most significant improvements we've seen have been in the new electronic dictionaries. Although the very best of these—the second edition of The Oxford English Dictionary—is on a CD-ROM, there are some excellent floppy disk-based dictionaries on the market; some are powerful enough to replace their printed counterparts.

Do you really need a big dictionary program? Today, electronic dictionaries are seldom used to verify the spelling of familiar words—your spell-checker can do that—but rather to define those words that aren't familiar. Time and again, small dictionaries will waste your time because they won't have any but the most common words. The moral: Unless you're strapped for space on your hard disk, buy a powerful dictionary.

Along with size, dictionaries can be judged on the basis of their definition lengths and on whether they include such useful features as pronunciation guides, syllable breaks, etymologies, idioms, and compound words. The best electronic dictionaries support *definition chaining* (the ability to read and define words that appear in the definition texts). Also useful are wildcard and Boolean searches. The former make it easy to locate a word when you're uncertain of its spelling; the latter can find related terms using the Boolean operators AND, OR, and NOT. For example, the search string "red OR scarlet AND flower" would yield such words as *rose*, *amaranth*, and *pyrethrum*.

Among the valuable extras included in good dictionaries are databases of biographical and geographical entries. Some packages also include a browse feature that displays all the entry words in alphabetical order, and a number have anagram generators. (Do you know that by

Our Contributors: RUBIN RABINOVITZ is a professor of English at the University of Colorado, Boulder, and a frequent contributor to *PC Magazine*. TED STEVENSON was the associate editor in charge of this story, and BEN Z. GOTTESMAN was the project leader.

rearranging the letters in *intoxicate* you can get *excitation*? Do you care? If not, you can probably survive without an anagram generator.)



EDITORS' CHOICE

THESAURI

Thesauri are somewhat better than those we looked at in our last writers' tools roundup, but they haven't improved at the same rate as dictionaries. There presently are no large CD-ROM thesauri, and the floppy disk-based packages have so far not reached the level where they can serve as substitutes for their printed counterparts.

One problem we've encountered in assessing both dictionaries and thesauri is that vendors' methods of tallying the words contained in their products at times lead to exaggerated claims of prowess. It's as if an auto manufacturer were using vehicles coasting downhill to measure miles per gallon. When confronted with disparities in their word counts and their products' performance, some publishers have asserted their right to count to the beat of a different drummer. But some may be trying to drum up more business by suggesting that their products are stronger than they really are.

The representative of a firm we'll call company A told me a cautionary tale. Once, company A's advertised word counts were accurate; but then company B, a firm with a less powerful product, inflated its word count. Company A's sales dropped off. Eventually, company A looked at its balance sheet and felt it had no choice but to follow suit. When it did, sales bounced back to their previous levels. In general, the word counts advertised by the publishers of writers' tools are reliable, but in those instances when a word count didn't correspond to a product's test results, we've pointed that out.

You may be wondering how the thesaurus that's integrated with your word processor compares with a standalone thesaurus. In most cases, these products are roughly equal in power. For example, the thesaurus by Soft-Art that's included in Microsoft Word for Windows got a score of 59 points on the performance test that gave Word Finder Plus for Windows a score of 62 and Random House Thesaurus a score of 57. This suggests that—as

• Random House Webster's Electronic Dictionary and Thesaurus, College Edition

Given the opportunity of saving only one of their cherished reference tools, most writers, we think, would reach without hesitation for their dictionaries. If they had time to grab a second, it would likely be a thesaurus. Fortunately for electronic writers,

our Editors' Choice, Random House Webster's Electronic Dictionary, comes in the same box with a very competent electronic thesaurus.

As a dictionary, Random House Webster's delivers a lot of content for the dollar; it stood out above its competition in almost every way. It achieved the highest score in our testing—the result of having the best-balanced lexicon of any product we reviewed. Business, technical, scientific, colloquial, and just plain obscure words were all grist for its mill.

This dictionary also provides pleasingly full definitions and a rich array of supporting information: etymology, pronunciation, syllabification, and clear illustrative examples of multiple meanings. Its inclusion of the ability to perform Boolean searches, an anagram generator, and linking definitions are all hallmarks of a good electronic dictionary.

Add to this an easy-to-use interface, integration with many popular word processors, disk space-saving data compression, a reasonable price, and a better-than-average thesaurus and you've got a clear winner.

If you must have the best electronic thesaurus available, take a look at Microlytics' Word Finder Plus for Windows. Although it didn't outscore the competition by a statistically significant margin on our tests, its high score, in combination with the accuracy of its definitions, marks it as the strongest entrant in a somewhat disappointing field. On the other hand, if you have a good printed thesaurus, don't go out of your way to replace it.

Those who need what a grammar checker provides should consider Grammatik 5, from WordPerfect Corp. (The product was originally owned by Reference Software, which was recently purchased by WordPerfect.) This thoroughly revamped product equaled or outperformed its rivals on every measure we devised. In our testing, it had the highest "hit" rate and gave the best advice on how to correct the problems. Also important is that no product had a lower "false hit" rate (flagging nonexistent errors). The success of Grammatik 5 is due in part to its new Mor-Proof parsing engine. It contains a special 100,000-word dictionary based on root words.

While Grammatik 5 represents the state of the art, we must mention that the art isn't at a very advanced state—yet.

Finally, we'd like to put in a good word for the best on-line style manual and best quotation dictionary in our roundup. If you're given to consulting style references (perhaps a better choice overall than relying on a grammar checker), what could be more convenient than having one right there inside your writing machine? Thanks to its ingenious interface and intelligent organization, Correct Writing, from WordStar International, impressed us more than any of its competitors. Quotation hounds should check out Quotes on Line from askSam Systems. Its abundance of quotations (12,000), its overall program quality, and its great price mark it as the strongest of the field of six contenders.

with grammar checkers—it's not worth buying a standalone thesaurus if you already have one in your word processor.

REFERENCE WORKS

Among the other writing tools available are a miscellany of reference works including style manuals, quotation dictionaries, and encyclopedias. A good rule when considering these programs is to avoid those whose printed counterparts you've never worked with.

Encyclopedias may be an exception to this rule: Electronic encyclopedias are fun to fool around with and may well interest children who never before have used an encyclopedia. The best of these products are on CD-ROM and offer such enhancements as sound, photos, animations, and video clips. (For a review of encyclopedias on CD-ROM, see *PC Magazine*, December 22, 1992.)

Floppy disk-based reference works are essentially on-line books, and they are not much better than their printed counterparts unless they're accompanied by good interfaces and retrieval engines. If they do have these features, you'll be pleasantly surprised by the amount of time they can save—if not hours, at least enough time for a leisurely mint julep.

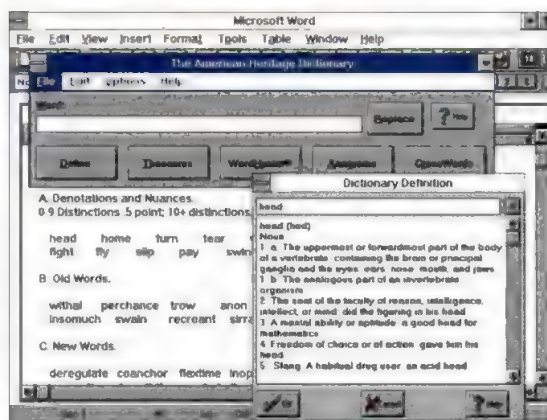
Dictionaries

WordStar International Inc.

The American Heritage Dictionary, Second College Edition

Last fall when WordStar International released The American Heritage Dictionary, Second College Edition (AHD College), \$129, claiming that it had 303,000 words (far more than any other dictionary on floppy disk), we were skeptical. And the tests we conducted at that time indicated that Random House Webster's (which claims 180,000 entry words) was, by a significant margin, the more powerful dictionary. WordStar has since changed its counting methods and concluded that AHD College in fact has 245,000 entry words.

This new count still seems high. In our tests for dictionaries, Random House



The Windows version of The American Heritage Dictionary, Second College Edition, can work inside popular Windows word processors.

Webster's got 99 out of a possible 100 points; MultiLex Professional Dictionary and Thesaurus (which claims 170,000 words) got 93 points, but AHD College got only 85.5 points. We performed another series of tests, sampling headword entries in the printed versions of Random House Webster's and AHD College (both programs are based on the complete texts of similarly named printed dictionaries). Here again, Random House Webster's consistently bested AHD College.

That said, it's also true that AHD College is a very good on-screen dictionary. It excels at defining professional, technical, and colloquial terms, and does well at covering the different senses of commonly used words. AHD College's weakest performance came in recognizing new words and terms from the arts. But even here, AHD College was usually only a few points behind the more powerful programs.

Like the American Heritage Dictionary, Office Edition (which we also reviewed in this roundup), AHD College is integrated with the Roget's II Electronic Thesaurus; its scores were lower than any other thesaurus we tested, but again, not by very much.

The College and Office Editions of AHD also share similar interfaces. But unlike the Office Edition, AHD College isn't available in retail outlets; you'll have to order directly from WordStar. If you own the older AHD Office and want a bigger dictionary, AHD College makes a good choice. You won't have to learn new commands, and the upgrade charge

of \$29.95 is less than you'd pay for one of the other big dictionaries.

AHD College works smoothly, offering features such as wildcard and Boolean searches, an anagram generator, and compatibility with popular word processors. While the Windows version won't read highlighted words directly from your word processor, you can import blocks of text with the Clipboard.

An upgraded version of this program, The American Heritage Dictionary Deluxe, Third Edition, will have an enlarged lexicon (bigger by about 6 percent) let you copy and paste entire definitions, and perform more complex searches than before. AHD Deluxe should be shipping by the time you read this.

FACT FILE

The American Heritage Dictionary, Second College Edition, Release 1.1

WordStar International Inc., 201 Alameda del Prado, Novato, CA 94949; 800-523-3520, 415-382-8000; fax, 415-883-1629

List price: \$129; upgrade, \$49.95.

Requires: 11MB hard disk space. For DOS version: 640K RAM, DOS 2.1 or higher. For Windows version: 2MB RAM, VGA monitor and card, DOS 3.1, Microsoft Windows 3.0

In short: The interface of The American Heritage Dictionary, Second College Edition, is similar to that of The American Heritage Dictionary, Office Edition, but the package comes with a much more powerful lexicon, longer definitions, and such extras as pronunciation guides and etymologies.

 ON READER SERVICE CARD

WordStar International Inc.

The American Heritage Dictionary, Office Edition

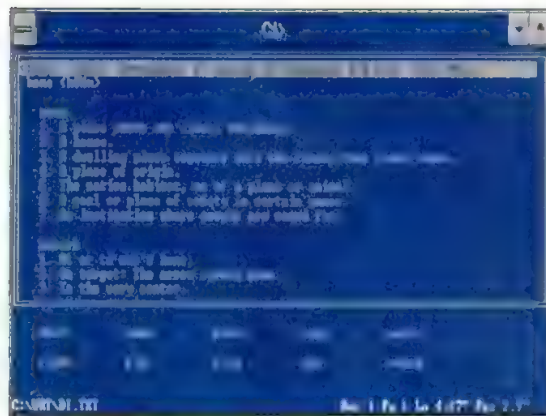
WordStar International's American Heritage Dictionary, Office Edition (AHD Office), \$99, is one of four programs based on Houghton Mifflin's American

Heritage Dictionary, Office Edition (the others are Instant Definitions, Key Dictionary Plus, and The Writer's Toolkit). All four of these on-screen dictionaries claim to have 116,000 entry words, but on our test, AHD Office scored only 43.5 points—11 points behind Funk & Wagnalls, which claims only 100,000 entry words.

In its time, an earlier release of AHD Office was the best product in its class: It won an Editors' Choice award in our last writers' tools roundup. But as its relatively low test score indicates, AHD Office has been outclassed by newer electronic dictionaries that have larger lexicons.

CHANGED

While you'll like AHD Office's relatively small 3MB hard disk space requirement, the software can't recognize many unfamiliar words, and its definitions are decidedly terse. The program does, however, offer such amenities as usage notes, etymologies, syllable breaks, wildcard searches, Boolean searches, and an anagram gener-



The American Heritage Dictionary, Office Edition, offers different senses of common words.

ator. The package also has an integrated thesaurus—Roget's II Electronic Thesaurus, another Houghton Mifflin product. As in the case of AHD Office, however, some newer products have eclipsed Roget's, which was originally released in 1987.

While AHD Office has no serious glitches, there are a few minor annoyances. The DOS version lacks a routine for customizing hotkeys, and if you want to amend the program's configuration file, you'll have to use a text editor. In addition, the Windows version of AHD Office can be awkward, because it doesn't transmit a highlighted word directly into the dictionary or thesaurus. To do this, you'll need to copy words into the Clipboard.

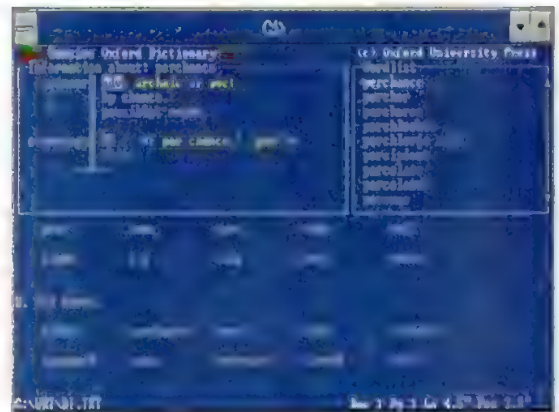
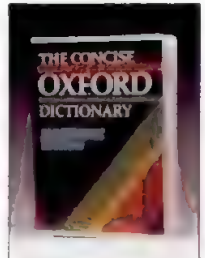
One other caveat: Because there's nothing on its package identifying it as AHD Office, this version of the dictionary can easily be confused with its far more powerful sibling, The American Heritage Dictionary, Second College Edition. Here's how to figure out which dictionary is which. AHD College is available only by direct mail from WordStar. It comes in a plain white box, has floppy disks labelled "College Edition," and requires 11MB of hard disk space. The smaller program, available through retail channels, comes in a red and black box that doesn't identify it as AHD Office. You will recognize it, however, if the box lists 3MB of hard disk space as a requirement.

Oxford University Press,
Electronic Publishing

The Concise Oxford Dictionary, Electronic Edition

Some prospective electronic-dictionary users might think that the name The Concise Oxford Dictionary, Electronic Edition, Version 1.0, suggests a small dictionary created exclusively for British users. But that is not entirely the case. Although its headwords do in fact use British forms such as *labour* and *centre*, the \$99 program can recognize and work with American variants. The dictionary also often lists both American and British colloquialisms. Thus, for the word *clobber*, The Concise Oxford gives the term's senses on both sides of the Atlantic: an American verb meaning "to hit repeatedly," and a British noun meaning "clothing or personal belongings."

It's also worth noting that the word



Hitting The Concise Oxford Dictionary's hotkey displays the dictionary's word list.

concise should in no way suggest that The Concise Oxford is puny—as electronic dictionaries go. The 88 points it garnered on our test ranked it as the third most powerful of the ten electronic dictionaries we tested. Oxford's dictionary is concise only in comparison with its giant sibling, The Oxford English Dictionary, Second Edition, a record-shattering CD-

FACT FILE

The American Heritage Dictionary, Office Edition

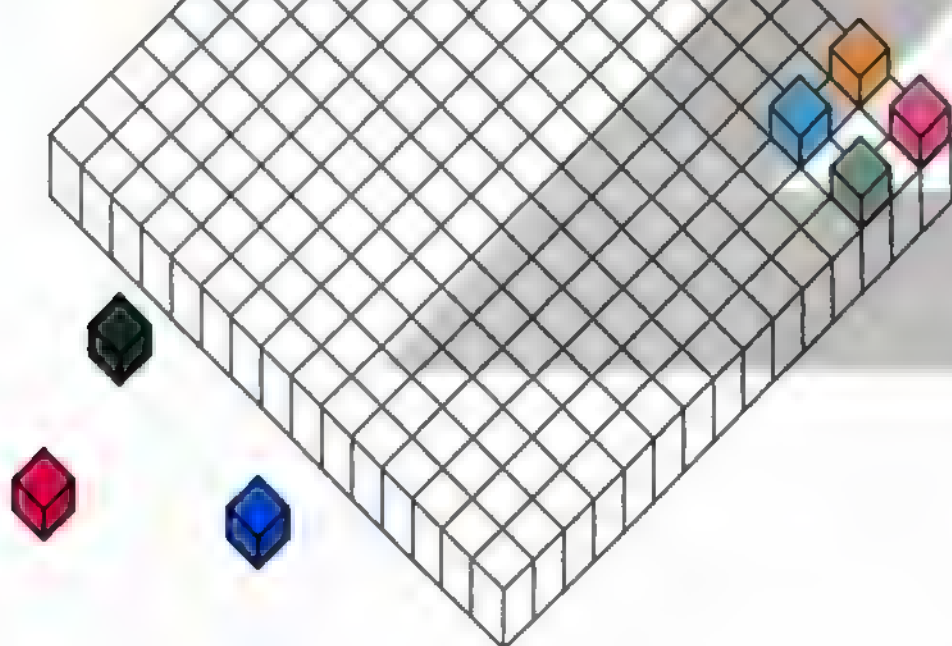
WordStar International Inc., 201 Alameda del Prado, Novato, CA 94949; 800-523-3520, 415-382-8000; fax, 415-883-1629

List price: \$99

Requires: 3MB hard disk space. For DOS version: 43K RAM for TSR, DOS 2.1 or later. For Windows version: 2MB RAM, VGA monitor and card, DOS 3.0, Microsoft Windows 3.0

In short: One of the four computer dictionaries we reviewed that are based on The American Heritage Dictionary, Office Edition, from Houghton Mifflin, WordStar's software package also offers Roget's II Electronic Thesaurus and useful features such as wildcard and Boolean searches

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VERY GOOD, OLD CHAP

The Concise Oxford is very good at supplying the senses of meaning for common words and at giving definitions for technical terms, rare words, and foreign terms. The only area where we found it lacking was in recognizing new words (it missed such terms as *deregulate* and *neoconservative*). Although it comes as a DOS-only program, it can run inside a Windows DOS box. Like similar packages, The Concise Oxford can run as a TSR and can read words from and paste them into popular word processing programs.

The Concise Oxford's display is different from those of most U.S. electronic dictionaries: When you stop your cursor at a word and hit the specified hotkey, the program displays a list of entry words. You then choose the word you want defined. If you like getting in and out of a dictionary quickly, you'll be bothered by the extra keystrokes this method demands; however, the wordlist display does give you an overview of nearby terms, as in a printed dictionary. This can be useful for browsing and for finding a word when you're unsure of its spelling.

TO THE POINT

The Concise Oxford often supplies short phrases to illustrate how words are used in context (*go for a walk*), and lists commonly used idioms (*walk all over*) and

compounds (*walk-on*). While it includes etymologies and supports wildcard searches, The Concise Oxford doesn't offer syllable breaks, pronunciations, or Boolean searches. Options for customizing the interface are limited: The program's color settings can't be changed, and its default hotkey combination won't work inside a Windows DOS box—although you can specify a different key

combination. At present, The Concise Oxford lacks an integrated thesaurus, but a companion program, The Oxford Thesaurus Electronic Edition, is being readied for release next year.

What The Concise Oxford lacks in special features it makes up for with a powerful lexicon that can define more words than most competitors. The package is a particularly good choice for any-

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FACT FILE

**The Concise Oxford Dictionary,
Electronic Edition, Version 1.0**

*Oxford University Press, Electronic
Publishing, 200 Madison Ave., New York,
NY 10016; 800-334-4249 ext. 7370, 212-679-
7300, ext. 7370; fax, 212-725-2972*

List price: \$99

Requires: 640K RAM, 4MB hard disk space, DOS 2.0 or later.

In short: While The Concise Oxford Dictionary lacks some extras found in similar packages, it's a powerful tool that includes both British and U.S. spellings

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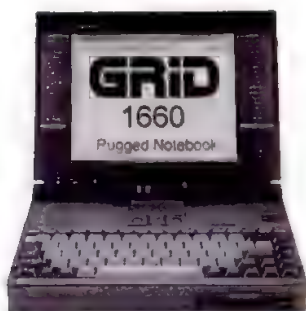


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How We Tested

Developing language-based programs can be a challenging task, and evaluating these programs is also complex. Some software companies test their writers' tools using sample documents; these are often unreliable because they reflect the idiosyncrasies of a single author's style. Our tests are based on examples of errors most users typically encounter.

GRAMMAR CHECKER TEST

PC Magazine's grammar test script is based on a series of sentences with the errors most often described in composition handbooks and style manuals directed toward people in the business and professional communities. The test script contains examples of 50 typical punctuation and capitalization errors and 75 typical grammar and style errors. Each error appears twice in our script, in two different sentences; this was to control for the possibility that a single example would be unusually easy or difficult for a particular program to detect. In fact, in many cases a grammar program could detect only one of the examples of a problem.

The following are some examples from the test:

Punctuation—Missing Possessive Apostrophe:

The cats food was in its dish.

The stores guard had fallen asleep.

Punctuation—Unneeded Comma:

However, he tries he still comes in third.
However, you argue you won't persuade me.

Grammar—Simple Error in Tense:

Albert walk to school.

Sue will returned in a while.

Grammar—Subject/Verb Agreement (Number):

The grapes and apples for dessert is on the counter.

Taking care of animals teach him responsibility.

In evaluating grammar programs, we checked for these possible responses to each of the test script sentences:

- **Hit.** The program flags an error.

- **Miss.** The program does not detect an error.
- **Advice.** The program gives one or more good suggestions for correcting an error.
- **False flag.** The program detects a nonexistent error or recommends a correction that introduces an error.

In scoring, we assigned point values for these responses as follows:

- **Hits.** We gave 1 point when a program detected an error in a test sentence. The best possible score was 100 for punctuation and 150 for style and grammar.

0—Misses an error.

1—Detects the error.

- **Advice.** We awarded points for the quality of the suggestions a program gave for amending errors. For each sentence, a program received one of the following scores. The maximum possible number of points was 400 for punctuation and 600 for style and grammar.

0—Fails to detect an error.

1—Flags an error but gives no advice, or inconsequential advice, for making corrections.

2—Flags an error but gives little useful advice for correcting it, or in sentences where several elements contribute to a problem, detects some but not all of them.

3—Flags an error or detects all the elements that contribute to a problem; advice is helpful but incomplete.

4—Flags an error or detects all the elements that contribute to a problem; gives adequate advice for corrections, or suggests correct alternatives to the error.

- **False flags.** We gave "negative" points for flagging nonexistent errors or giving advice that introduced new errors. The best possible score was 0; the worst

score was 250 points.

0—No false flags.

1—One or more false flags per sentence.

The number of rules a program uses when it scans a document can be adjusted; this changes the sensitivity of a grammar checker so that it responds to a greater or smaller number of errors. As the programs become more sensitive to errors, their rate of false flagging increases commensurately. For this reason, we explained our testing methods to the publishers of the grammar checkers we reviewed and asked them to recommend the settings for our tests. We tested all of the programs at their publishers' recommended settings.

• **Hits-to-False-Flags Ratio** is the relative number of hits and false alarms: A 2:1 ratio means that a program detects real errors twice as often as it reports nonexistent ones. The higher the hits-to-false-flags ratio, the less likely that the program will report nonexistent errors or offer bad advice.

GRAMMAR PROGRAMS AS SPELL-CHECKERS

A program that can simultaneously check spelling and grammar will save a great deal of time. Moreover, spell-checkers can sometimes help detect errors in punctuation and grammar such as a missing period in an abbreviation (for example, *Dr*) or an improper verb formation (for example, *runned*).

Our spelling test script contains 100 misspelled words in ten categories: simple spelling errors, common words often misspelled, abbreviations without or with periods, common proper nouns, words ending in *-ancel-ence* or *-ible/-able*, foreign words that recently entered English, professional terms, scientific and technical terms, business terms, and hyphenated compound words.

The standard of comparison for this test is a printed desk dictionary. We gave 1 point for recognizing a misspelled word and suggesting the correct alternative; the maximum score was 100 points.

DICTIONARY TEST

The first section of the test measures a

dictionary's ability to define a common word's different meanings and shades of meaning. No points were awarded for noting fewer than five distinctions; one-half of a point was awarded for five to nine distinctions, and 1 point was awarded for ten or more distinctions. In other portions of the test, we awarded 1 point per word for a program's ability to define words from the following categories: old words, new words, foreign terms that recently entered English, rare words, professional terms, business terms, colloquial terms, scientific and technical terms, and terms from the arts. The standard of comparison for this test is a good college dictionary. The maximum score was 100 points.

THESAURUS TEST

The first section of the test measures a thesaurus's ability to provide synonyms for five common words with meanings as nouns and verbs and different shades of meaning. No points were awarded for supplying 0 to 9 synonyms for these words. We awarded 1 point for 10 to 19 synonyms, 2 points for 20 to 29 synonyms, 3 points for 30 to 39 synonyms, 4 points for 40 to 49 synonyms, 5 points for 50 to 59 synonyms, and 6 points for 60 or more synonyms.

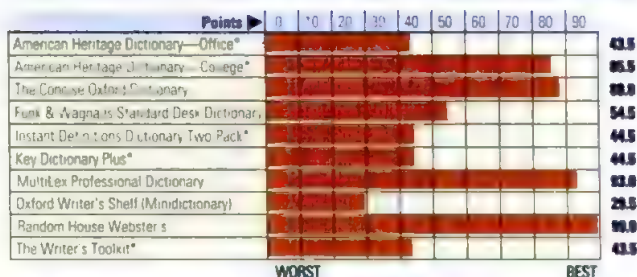
In the remaining portions of the test, we awarded 1 point per word for a program's ability to supply synonyms for words from the following categories: common words with meanings as nouns, verbs, and modifiers; modifiers; rare words; professional terms; business terms; colloquial terms; and foreign terms that recently entered English. The standard of comparison for this test is a good desk thesaurus. The maximum score was 100 points.

PUNCTUATION

	Hits (best score = 100)	Advice (best score = 400)	False Flags (worst score = 100)
Correct Grammar*	22	68	8
Grammatik 5	36	125	10
PowerEdit	26	71	47
RightWriter	25	83	13
The Writer's Toolkit*	22	65	10

* Based on The Houghton Mifflin CorrectText Grammar and Style Checker

DICTIONARY PERFORMANCE



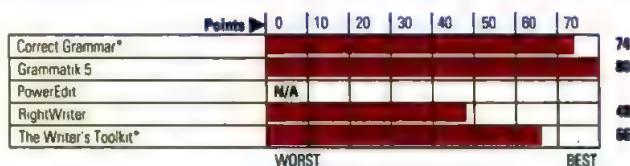
* Based on Houghton Mifflin Co.'s The American Heritage Dictionary, Office Edition.

THESAURUS PERFORMANCE



* Based on Houghton Mifflin Co.'s Roget's II Electronic Thesaurus

SPELLING PERFORMANCE



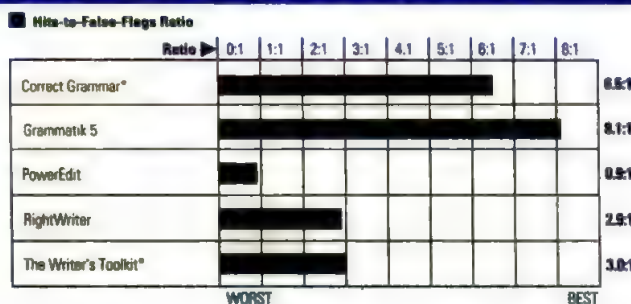
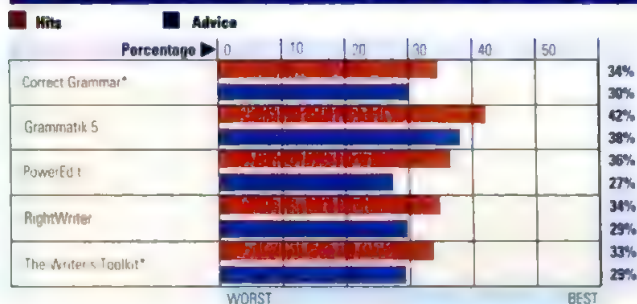
N/A—Not applicable. The product does not include a spell-checker

* Based on The Houghton Mifflin CorrectText Grammar and Style Checker

STYLE AND GRAMMAR

	Hits (best score = 150)	Advice (best score = 600)	False Flags (worst score = 150)
Correct Grammar*	63	234	5
Grammatik 5	69	258	3
PowerEdit	64	201	55
RightWriter	60	207	16
The Writer's Toolkit*	60	222	17

OVERALL RESULTS FOR PUNCTUATION, STYLE, AND GRAMMAR





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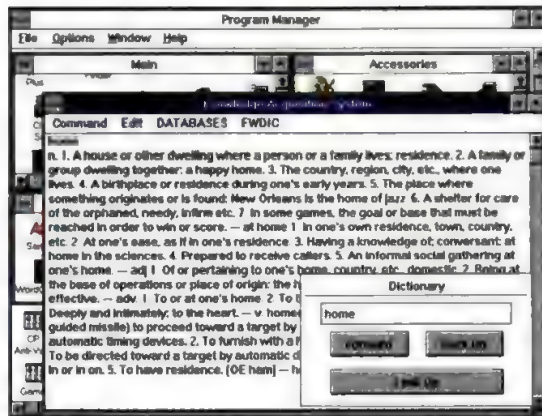
Funk & Wagnalls Standard Desk Dictionary

The \$79.95 Funk & Wagnalls Standard Desk Dictionary, Version 2.0, from Inductel, offers the complete contents of a similarly named printed dictionary published by HarperCollins. In addition to being a standalone product, the electronic dictionary is also part of Inductel's Knowledge Acquisition System, a series of integrated on-screen modules that includes electronic editions of The Concise Dictionary of 26 Languages, Brody's Medical Dictionary, and six McGraw-Hill technical dictionaries.

As its statistics indicate, Funk & Wagnalls is an intermediate-size package: It claims 100,000 entry words, requires 5.6MB of hard disk space, and received a score of 54.5 on our dictionary test. The program's best performance came in dealing with the nuances of common words, in defining foreign words that recently came into English, and in recognizing archaic terms. However, Funk & Wagnalls Standard Desk Dictionary received its lowest scores in recognizing new words (*lip-synch*, *postmodern*), business terms (*arbitrageur*, *recapitalization*), and terms from the arts (*Kabuki*, *subtext*).

GETTING FUNKY

Available in both Windows and DOS versions, Funk & Wagnalls gives medium-length definitions in its entries and includes etymologies, syllable breaks, idioms, and compound words. It supports wildcard searches but lacks an integrated thesaurus, pronunciations, and a Boolean-search feature. Funk & Wagnalls comes with a number of concise databases—dictionaries of computer terms, geographical listings, and biographical information; a secretarial handbook; and an abbreviations handbook—which are



Funk & Wagnalls Standard Desk Dictionary's Knowledge Acquisition System makes finding definitions easy.

at times helpful, but which would have been easier to get at if they had been included under the general dictionary's headings.

Funk & Wagnalls can look up words after reading them from your document or after you type them in. Unlike other programs, it can also display a list of alpha-character ranges and can let you home in on a headword list that (with luck) includes the word you're looking for. Funk & Wagnalls displays the definitions in a large data-filled screen, a feature that lets you find the item you need faster than with programs that make you go from screen to screen looking for a particular word form.

FACT FILE

Funk & Wagnalls Standard Desk Dictionary, Version 2.0

Inductel Inc., 5339 Prospect Rd., #321, San Jose, CA 95129; 408-866-8016; fax, 408-243-1762

List price: \$79.95.

Requires: 5.6MB hard disk space, DOS 3.0. For DOS version: 420K RAM. For Windows version: 2MB RAM, Microsoft Windows 3.0 or later.

In short: Part of a series that includes the McGraw-Hill technical dictionaries, Version 2.0 of the Funk & Wagnalls Standard Desk Dictionary is hampered by a quirky installation program, a relatively small lexicon, and—in the DOS version—a user interface that is difficult to navigate.


 ON READER SERVICE CARD

GETTING STUCK

In many other respects, however, Funk & Wagnalls is more difficult than it needs to be. The installation program is complex and has a bug that you'll be able to solve only by calling the company on the phone. The Windows version that was shipping at the time of this review gives installation instructions only for Windows 3.0, while users must currently phone the vendor to get Windows 3.1 installation instructions. The dictionary's manual, which doubles as the documentation for

Inductel's Dictionary of 26 Languages, is poorly organized and in some places difficult to understand.

The Microsoft Windows edition of Funk & Wagnalls works well, but the DOS version has a number of odd commands that make it somewhat difficult to learn. Unless you are planning to use Funk & Wagnalls in conjunction with one of the other Knowledge Acquisition System modules, you will do better with one of the larger, easier-to-use computer dictionaries.

WordScience Corp.

Instant Definitions Dictionary Two-Pack

WordScience Corp.'s Instant Definitions Dictionary Two-Pack is one of four programs on the market that are based on Houghton Mifflin's American Heritage Dictionary, Office Edition. Because it comes without a thesaurus, Instant Definitions uses about 500K less hard disk space than the Office Edition of WordStar's American Heritage Dictionary. The \$69 Instant Definitions also lacks extras included in other programs, such as an anagram generator and biographical and geographical entries. Moreover, its definitions are a bit too short.

Like Key Dictionary Plus, Instant





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KUR-0012

▪ Notable Quotables: *On-Line*

"Quotation confesses inferiority," said Ralph Waldo Emerson, who also was of the opinion that "a great man quotes bravely." Inconsistent? Perhaps, but wasn't it Emerson who explained that "a foolish consistency is the hobgoblin of little minds"?

Quotations are like statistics: You can prove almost anything with them. And whether you're striving for greatness, inferiority, or a clever inconsistency, you'll find a quotation dictionary helpful for adding sparkle to your writing and for locating the source of a famous phrase.

The larger the quotation dictionary, the better the chance that you'll find the passage you're looking for. A large printed work such as Stevenson's *Home Book of Quotations* lists about 75,000 items; the more familiar *Bartlett's* offers 22,000. The biggest on-line quotation dictionary currently available, *Bartlett's* is available in its entirety on Microsoft Corp.'s CD-ROM disk Microsoft Bookshelf (for a review, see *PC Magazine*, December 22, 1992).

WHO SAID IT BEST

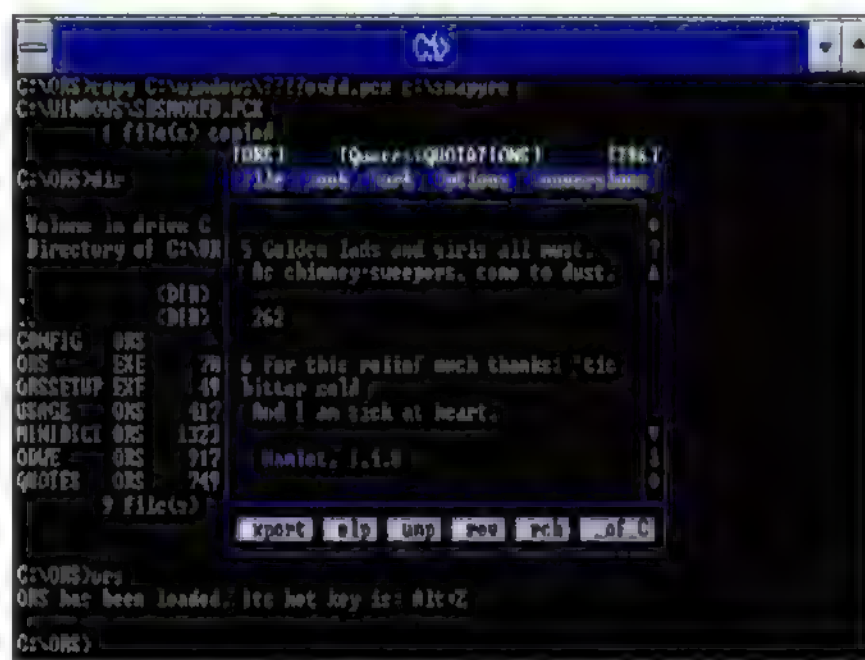
Disk-based quotation programs come with from 2,000 to 12,000 entries: Clearly, not even the biggest can match their bound counterparts in size. This disadvantage is offset by the convenience of the on-line reference works: They allow you to locate passages quickly, and they contain routines for letting you copy quotations into your own documents.

In addition to considering size and efficiency, you should consider whether a quotation dictionary clusters items by author (like *Bartlett's*) or by topic (like *Stevenson's*). Each format has its advantages; in general, the first kind is better when you're seeking the source of an allusion, and the second kind is better when you're looking for a passage to

enliven your writing. Some electronic quotation dictionaries let you choose whether quotations are displayed by source or topic; this, obviously, is the best-of-both-worlds option.

The Oxford Minidictionary of Quotations

Two of the programs we reviewed come with their own quotation dictionaries. The Oxford Minidictionary of Quota-



Oxford Writer's Shelf offers a relatively small quotation dictionary called The Oxford Minidictionary of Quotations.

tions, a 4,000-item quotation program, is included in the DOS-only Oxford Writer's Shelf (212-679-7300, ext. 7370). Like other programs in Oxford Writer's Shelf, the Minidictionary is minuscule in comparison with rival products. It is also handicapped by the undersized display window and the nonintuitive interface Oxford uses for all its Writer's Shelf modules.

The Concise Columbia Dictionary of Quotations

The Concise Columbia Dictionary of Quotations, part of The Writer's Toolkit, has over 6,000 quotations. This is the same as the quotation dictionary included in Microsoft Bookshelf on CD-ROM (Bookshelf comes with two quotation dictionaries, this one and *Bartlett's*). Many of the quotations in the Concise Columbia Dictionary are

taken from modern sources.

In its Windows version, this dictionary has a logical interface that pops up inside the Writer's Toolkit window with the other modules displayed nearby as icons; this is convenient when you want to move to another module quickly. You can enlarge the size of the program window to display larger blocks of text—a useful option usually missing from DOS quotation programs.

The Concise Columbia Dictionary has another valuable feature: It allows you to search for and display quotations by either topic or author. The Writer's Toolkit's quotation dictionary is also available in a DOS version. While both releases have similar databases, the Windows version, as might be expected, is easier to use. For the program price and telephone number, see the main review.

Correct Quotes

Correct Quotes, a 5,000-quotation, 2MB standalone program (\$49, from WordStar International, 800-523-3520), is also available in both DOS and Windows editions; again, a superior interface makes the Windows version preferable. In the Windows release, the program's main screen simulates a keypad with a series of alphabetic buttons. Clicking on one of these buttons takes you to a 600-heading list of topics, and the list quickly leads you to the quotations. Selecting quotations by author, however, is more difficult. There is no push button to select quotes by author, so you must search by the author's name before getting a list of associated quotations.

You can search for keywords, export text to a file or to your printer, and add your own quotations and topic headings to the database. Correct Quotes has one annoying quirk: During a search—and some can last for 5 minutes, even on a fast machine—the program takes con-

trol of your computer. You can't cancel the routine or even Alt-Tab out of it; if you lose patience, the only key combination that will work is the one you may be most reluctant to use: Ctrl-Alt-Del.

Wisdom of the Ages

Wisdom of the Ages, Version 5.1, based on a shareware package of the same name, offers 6,500 quotations in a 1.8MB program (\$99, Micro Computer Resources, 800-767-6797). A DOS-only product, Wisdom of the Ages—like some of the other packages reviewed here—can run in a Windows DOS box and export text to a file or printer.

Wisdom of the Ages has a unique way of organizing the material under its 81 headings: Each topic is divided into seven sections, including Essence, Opposites, Positive, Negative, and Advice. You can search for keywords or look for quotations that deal with two subjects by using the program's Link Selection Mode to display an alphabetical list of 2,000 items cross-referenced by both primary and secondary topics.

While the program is organized topically, you can also find items using an authors menu that includes brief biographical facts. And if you're ready for a fresh bit of time-tested wisdom with your morning coffee, you'll like the Wisdom of the Ages quote-of-the-day feature.

Wisdom of the Ages has some minor irritants: slow searches, an eccentric interface that takes time to learn, and—in its on-line notes—a sappy, mother-of-all-truth tone ("When the World-Mind is focused by the Universal Language, the resulting beam of light can be directed to illuminate any portion of the great road we all travel that connects the past to the future"). Try *that* quotation with your morning coffee.

Quotemaster Plus

Quotemaster Plus comes in a number of flavors. Available in both DOS (Version 5.0) and Windows (Version 2.0) editions, it comes as a basic 3MB version

with 3,000 quotations for \$89. You can upgrade the program with 1,600-quotation modules (Quotepacks) at \$60 a pop, add an author-information package for \$45, or take the plunge and get the complete 5.5MB package—9,200 quotations—for \$270 (PennComp Software Development, 800-326-6145).

The DOS version of Quotemaster Plus is logically designed and easy to use, and can run as a TSR. Along with the ability to locate quotations by subject and author, Quotemaster Plus has a useful Power Search feature that lists entries by primary and secondary topics. But this method also has a drawback:



Quotes on Line lets you browse through its extensive list of authors or conduct name searches to find quotations by source.

The program displays only one quotation at a time, which can mean extra keystrokes when you're looking for a particular item.

The Windows version of Quotemaster Plus handles this problem better. The opening phrases of the quotations listed for a topic are displayed together with their subtopics, sources, and periods; this makes browsing easier. The Windows version of the program has a better interface than any other quotation dictionary: It's logical and easy to use, and it offers excellent search routines. Once you get past the sketchy installation instructions, you'll like Quotemaster Plus for Windows.

Quotemaster Plus in either its DOS or Windows version is, however, the most expensive quotation dictionary we looked at. Depending on the precise

configuration you choose, you'll be paying from \$2.93 to \$3.75 per hundred quotations. This is considerably higher than the cost per hundred for rival programs: Wisdom of the Ages, \$1.52; Correct Quotes, \$0.98; and—the most economical of all—Quotes on Line, \$0.74.

Quotes on Line

Quotes on Line is a 4MB DOS-only program; its 12,000 items make it the biggest disk-based program in this group (\$89, from askSam Systems, 800-800-1997). Quotes on Line offers three types of help information: an automatic display of on-screen help, additional context-sensitive help that's retrieved when you press the F1 key, and a comprehensive indexed on-line help document that treats the entire program. These routines, together with the program's well-organized interface and good manual, make it easy to learn and use.

Quotes on Line lets you find quotations by topic, by subtopic, and by author, and by using a keyword (or keywords) to search the entire database; the searches permit you to use wildcards and Boolean operators. The program's only real flaw is a drab interface (so far, Quotes on Line is not available in a Windows version).

Quotes on Line makes browsing easy by displaying a group of quotations on-screen simultaneously. Like the best programs of this kind, Quotes on Line can cluster quotations by either author or topic, and can export text to a printer or an ASCII file. Comprehensive, intelligently designed, and reasonably priced, Quotes on Line is not only the best deal among quotation dictionaries, but the best quotation dictionary we looked at.

If you decide to get a quotation dictionary, you'll find it more than just useful: Poking around in these programs is fun, as you discover one fascinating item after another. And maybe—just maybe—you'll also discover a focused beam of World-Mind light on that great past-to-future road we all must travel. □

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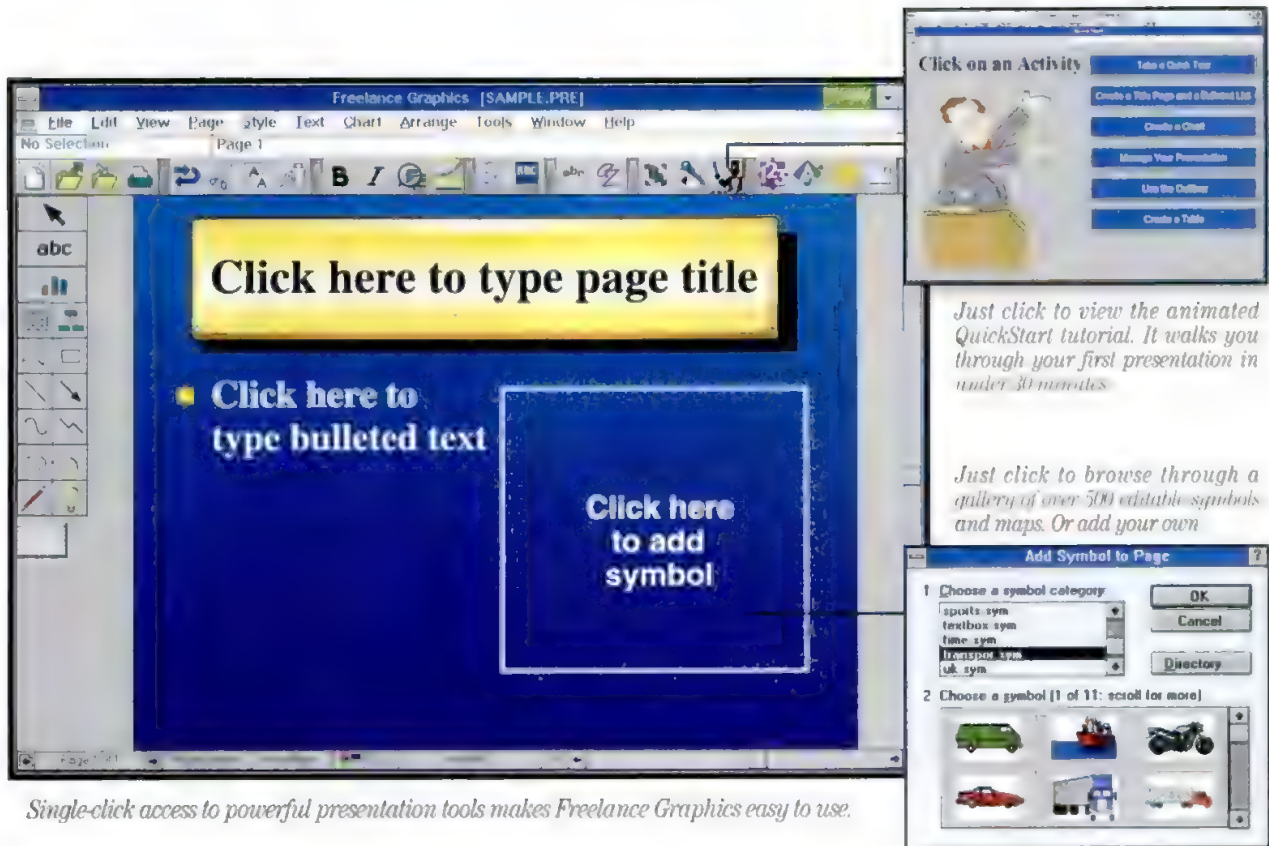
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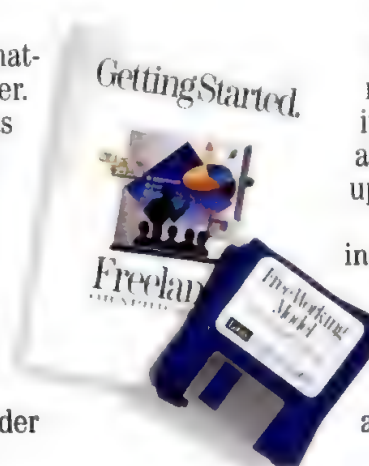
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SOFTWARE

Writers' Tools



Instant Definitions Dictionary Two-Pack can pop up over a word processor running inside a Windows DOS box.

Definitions scored marginally higher on our dictionary test than its two sister packages, The American Heritage Dictionary, Office Edition, and The Writer's Toolkit. This is because the former two programs have slightly newer (and larger) lexicon files than the others. But this is a small difference in power, and not enough to tip the balance decisively toward any one product.

CUSTOMIZE

Available only in a DOS release, Instant Definitions (unlike AHD Office) has a routine for changing hotkeys and screen colors from inside the program, and it can use expanded memory to reduce its TSR to a mere 4K of RAM. Like other Houghton Mifflin dictionary packages, Instant Definitions will look up definitions at the DOS prompt or work from

inside popular word processors. A useful feature is a special switch to improve readability on laptops.

WordScience calls Instant Definitions a "Two-Pack" because it includes both 3.5- and 5.25-inch floppy disks in the package, and includes two manuals (one of these, however, is very brief). The idea is for you to promote literacy by donating the set you don't need to a local school.

Instant Definitions Dictionary Two-Pack is to electronic dictionaries what lite is to beer.

On the one hand, its small database means it can't rival the power of programs like MultiLex or Random House Webster's. However, its relatively modest 2.5MB storage requirement could be just right for a small hard disk like the one on your portable.

SoftKey Software Products Inc.

Key Dictionary Plus

Key Dictionary Plus is paradoxically named. The package is smaller than similar dictionary programs, so the significance of the "Plus" in its name is unclear. Yet another of the software packages based on Houghton Mifflin's American Heritage Dictionary, Office Edition, SoftKey Software Products' dictionary is similar to the WordStar International version of the program—minus the thesaurus, the anagram generator, and the support for wildcard searches. (SoftKey is a company that often repackages well-known computer programs under its own name. For example, its Key Grammar Checker is based on an older version of RightWriter.)

KEY WORDS

Key Dictionary Plus's score of 44.5 (out of a possible 100 points) on PC Magazine Labs' test is the same as that of Instant Definitions. Again, like Instant Definitions, Key Dictionary is a DOS-only program that can run from a small TSR

FACT FILE

Key Dictionary Plus

SoftKey Software Products Inc., 4800 N. Federal Hwy., 3rd Floor, Building D, Boca Raton, FL 33431; 800-377-6567, 407-367-0005; fax, 407-367-1611

List price: \$39.95.

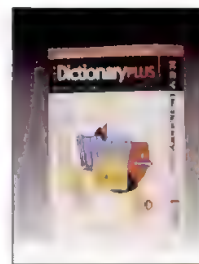
Requires: 512K RAM, 2.3MB hard disk space, DOS 2.0 or higher.

In short: One of the programs based on Houghton Mifflin's American Heritage Dictionary, Office Edition, Key Dictionary Plus (like Instant Definitions) is a small program best suited for laptops and portables.



ON READER SERVICE CARD

if you have EMS memory. Indeed, the contents of the two packages are virtually identical, although Key Dictionary Plus lacks an extra manual like the one that Instant Definitions includes for its school-donation program.



The only substantive difference between these two products is in dollars and cents: Again calling attention to its enigmatic name, SoftKey Software Product's Key Dic-

tionary Plus costs less than Instant Definitions (\$39.95 versus \$69). Therefore, if you don't need a thesaurus and are sold on the Office Edition of Houghton Mifflin's American Heritage Dictionary, Key Dictionary Plus provides an economical way to get just what you're looking for on-screen.



When Key Dictionary Plus can't give you the meaning of a word, it suggests a number of similarly spelled alternatives.

FACT FILE

Instant Definitions Dictionary Two-Pack

WordScience Corp., 1415 Oakland Blvd., #220, Walnut Creek, CA 94596; 800-869-9673, 510-939-1190; fax, 510-939-1263

List price: \$69.

Requires: 4K RAM for TSR, 2.5MB hard disk space, DOS 2.0 or higher.

In short: Originally called Definitions Plus, the DOS-only Instant Definitions Dictionary Two-Pack is based on Houghton Mifflin's American Heritage Dictionary, Office Edition. Instant Definitions is a small dictionary suitable for portables and laptops.



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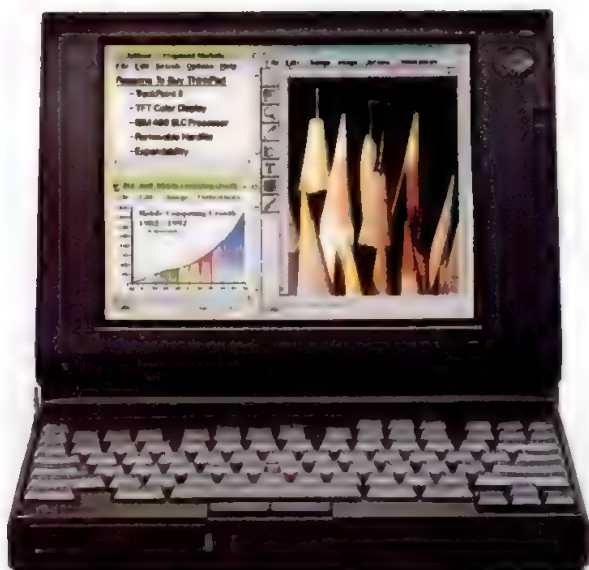
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***Screen at right depicts OS/2, also available pre-installed on this model.

††ThinkPad 300 and 700C systems and options are manufactured in Japan. PS/ValuePoint 6312, 6314, and 6319 Color Displays are manufactured in Korea. PowerGraph X-24 graphics adapter is manufactured in Mexico.

†††PRODIGY will not run without a modem. A modem is not included with the ThinkPad 700C. A customer who acquires a ThinkPad 700C and a modem which operates at a speed below 9600bps may contact PRODIGY to obtain a One-Month Free Trial Membership.

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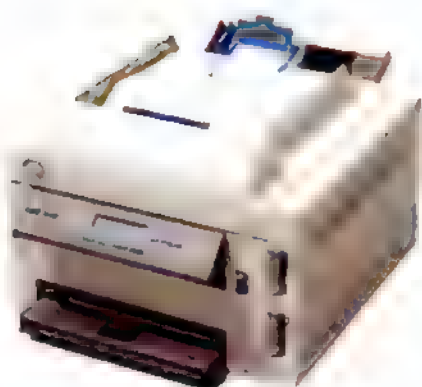
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ThinkPad 700 and 700C Options		Price*
Data/Fax Modem (2400 bps/9600 bps)		\$285
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IBM LAN Adapter for Ethernet TP (ISA: 10 BaseT)		\$127
PC LAN Program 1.3		\$185
NetWare® V3.1 (5 User)		\$720
IBM OS/2 LAN Server 3.0 Entry		\$505
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IBM Personal Printer Series II, 2390		\$385
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PostScript® Option for 4019 (E), 4029		\$335
Technical support for IBM printers is provided by Lexmark™ International, Inc.		
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IBM 6312 Color Display		\$405
IBM 6314 Color Display¹		\$530
IBM 6319 Color Display		\$660



Expansion Unit (Docking Station)

The 3550 Expansion Unit for ThinkPad 700 and 700C gives you two slots and one bay, and accommodates 5.25-inch or 3.5-inch SCSI devices.

\$859*

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■ Writing in Style: *On-Line Style*

When your grammar-checking program leaves you scratching your head—and at times even the best of them will—a style manual may be just the ticket for learning more about a specific writing problem. The best style manuals cover a broad spectrum of topics and have efficient search routines to let you quickly find the data you need.

Most style manuals are essentially on-line books coupled with search routines. This is true of *The Elements of Style* from Microlytics, which is based on the best-selling book of the same name by William Strunk, Jr., and E. B. White. When we looked at this DOS-only program in our last roundup (*PC Magazine*, September 24, 1991), we found it generally good, although lacking in some of the extra features found in rival products.

PART AND PARCEL

Two of the multiprogram packages of writers' tools we've looked at here come with integrated style manuals. The first, *The Written Word III* from Houghton Mifflin Co., is available in both the DOS and the Windows versions of *The Writer's Toolkit* (for the price and telephone number, see the main product review). When you load the Handbook module, you'll see a display of its table of contents; you can scroll through it or use a search routine to display one of its entries. In addition, you can search a detailed index of more specific subjects. Main topics covered in *The Written Word III* include spell-

ing, punctuation, word compounding, grammar, usage, and working with specific types of documents such as business letters and reports.

Another style manual included in a program collection is *The Oxford Miniguide to English Usage*, part of *Oxford Writer's Shelf* (for details, see the main product review). Available only for DOS, the Miniguide covers the basics of punctuation, grammar, and style. There's a section on pronunciation, with information on spoken English in America and in Britain, together with a discussion of word formation that offers information on how many words are spelled. A guide to usage gives the dos and don'ts of individual word usage. There's some helpful information in this program, but it's limited, often hard to get at, and in places more geared to British than to American writers.

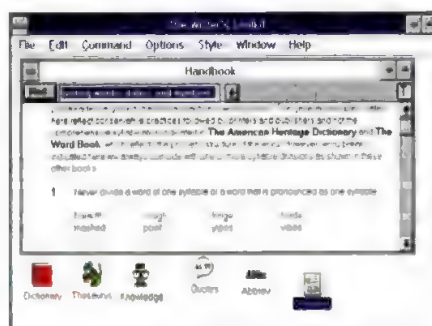
STYLE-ISH

One of the most convenient manuals around is *Correct Writing* (\$59, from WordStar International, 800-523-3520), particularly in its Windows edition. *Correct Writing* has a search routine for locating specific items, but there's an additional feature that makes getting around the program a

breeze. *Correct Writing's* information is presented under a series of topic headings such as capitalization, punctuation, spelling, compound words, abbreviations, tables of contents, footnotes, and bibliographies. The program's interface is designed to look like an open notebook, and these topic headings are displayed on representations of index tabs. The index tabs remain visible even when you're look-

ing up specific items, and clicking on a tab quickly takes you to the information you want. It's this clever interface that gives *Correct Writing* an edge over other style manuals and makes it so easy to use.

Before buying an electronic style manual, you might consider how much use you can expect to get from it. If you like the on-line manuals some publishers have recently included in some programs, you'll probably enjoy working with an electronic style manual. If on the other hand you've been frustrated by on-line documentation, you should think twice about buying an electronic style manual. Given that it's probably not a tool you'll be using daily, you may not be able to justify the difference in cost between the printed and electronic versions. □



The *Writer's Toolkit* style manual, *The Written Word III*, allows you to scan the table of contents and index.

MultiLing International Inc.

MultiLex Professional Dictionary and Thesaurus

MultiLex Professional Dictionary and Thesaurus, Version 3.0 (\$69), like some rival programs, combines a powerful dic-

tionary with a mediocre thesaurus. The program, based on Simon & Schuster's Webster's New World Dictionary and Webster's New World Thesaurus, is very strong in many categories, including terms from the arts, colloquialisms, business terms (it defined such words as *arbitrageur* and *Keynesian*), and technical terms (it defined *raster* and *nucleotide*).

MultiLex's publisher, MultiLing In-

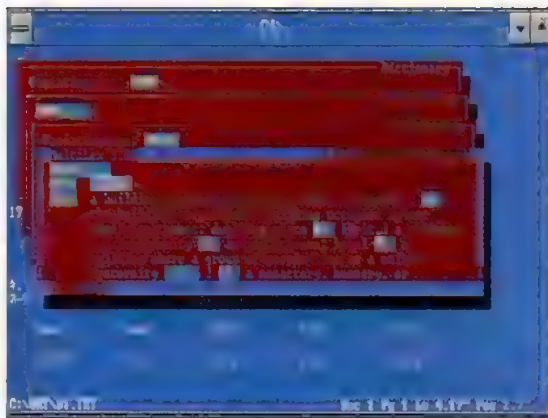
ternational, claims 170,000 entry words for the dictionary, which puts it just behind Random House Webster's figure of 180,000 entries. These claims correspond to our dictionary test results: MultiLex scored 93 points, only slightly less than Random House Webster's score of 99. MultiLex, however, needs better data compression: The package requires 12.4MB of hard disk space, more than

any other program we looked at for this roundup.

MULTISELECT

MultiLex Professional Dictionary provides its entries with broad selections of idioms (such as *head over heels*, *head off*) and compound forms (*head-cold*, *head start*). The MultiLex entries also indicate whether a word is colloquial or archaic, and some provide examples of how a word is used in context. While MultiLex identifies the parts of speech of entry words, it doesn't include pronunciations or etymologies—features that are standard in many electronic dictionaries. MultiLex's definitions are more comprehensive than those of some other dictionaries but shorter than Random House Webster's.

MultiLex Thesaurus, based on the printed version of Webster's New World Thesaurus, got a score of 61.5 in our testing, making it one of the best performers in its group. MultiLex got high scores for supplying synonyms for modifiers, business terms, and different senses of common words. It's not as good as Word Finder Plus for Windows, however, at



MultiLex Professional Dictionary and Thesaurus will open additional windows to explain words in definitions.

finding synonyms for common words. MultiLex Thesaurus includes synonyms for compounds and idioms (for example, *put across* and *put down*) as well as a selection of antonyms.



MISSTEP

MultiLex Thesaurus is weakest when supplying equivalents for entry words. Thus, for *put*, MultiLex suggested *settle* and *invest in*; for *reach* it offered *give away*, *strain*, and *strike*; and for *meet* it gave *concentrate*, *focalize*, and *adhere*. In many cases, synonyms are repeated under different senses of a word, and some are hardly colloquial.

You can get the thesaurus as part of the dictionary package, or buy either the dictionary or thesaurus as a standalone program. Both are fast and adaptable: It's easy to change their default color configurations and hotkeys. Working with either of the MultiLex modules can be awkward, however, because of an interface that displays the different senses of a word in separate windows. Thus, when you're dealing with long entries, you'll waste seconds and keystrokes moving from window to window seeking the item you need.

Another glitch is a conflict between the program's TSR and the Stealth routine in QEMM, Quarterdeck's memory manager. Removing the Stealth parameter from the QEMM statement in your

CONFIG.SYS file will solve that problem. While only a DOS version of MultiLex is currently available, a Windows edition is due for release by midyear, and will probably solve both the interface problem and the TSR conflict.

MultiLex's greatest strengths are its modest price and its dictionary's large lexicon, making it a good value on a words-per-dollar basis.

Oxford University Press, Electronic Publishing Oxford Writer's Shelf

The \$119 Oxford Writer's Shelf, Version 1.0, is a collection of DOS programs that can be launched from a single pop-up TSR. The group includes a conversion table for metric weights and measures and bundles four main program modules: a quotations dictionary, a style manual, a writer's handbook, and a definitions dictionary.

The included Oxford Minidictionary of Quotations contains some 4,000 quotations from over 700 authors. Even for an electronic reference work, however, this isn't a very massive collection. Quotations are indexed by author and keyword; you can scroll through an index or use a search to go to an index heading. Quotations, like the other material in the package, can be pasted directly into your word processor.

The Oxford Miniguide to English Us-



Oxford Writer's Shelf's minidictionary gives British but not U.S. spellings—*honour* but not *honor*.

FACT FILE

MultiLex Professional Dictionary and Thesaurus, Version 3.0

MultiLing International Inc., The Kress
Building, 40 South 100 West, P.O. Box 169,
Provo, UT 84601; 800-748-5455,
801-377-7077; fax, 801-377-7085

List price: Dictionary, \$49; Thesaurus, \$29; both packages, \$69

Requires: 44K RAM (but can use expanded memory), 12 4MB hard disk space (for both dictionary and thesaurus), DOS 3.0 or higher

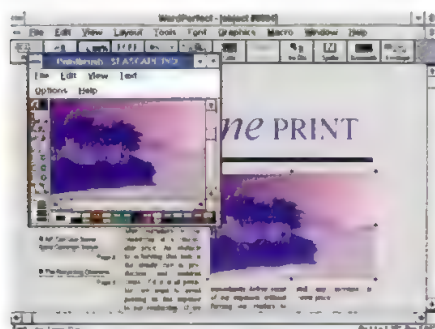
In short: A powerful and reasonably-priced DOS-only dictionary with a companion thesaurus program. Version 3.0 of MultiLex Professional Dictionary and Thesaurus got the second-highest score on our dictionary test

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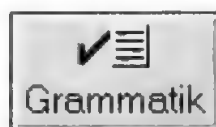
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WordPerfect

age, a manual that covers the essentials of good writing, has sections on abbreviations, punctuation, grammar, clichés, and similar topics.

The Oxford Dictionary for Writers and Editors is an on-screen, alphabetically arranged, handbook of items such as abbreviation forms, biographical and geographical data, and common stylistic errors ("not *writers' cramp*, but *writer's cramp*"). Many of these entries, however,

will be of greater interest to British than to American writers (*WPC* is an abbreviation for *Woman Police Constable*; *RoSPA*, for *Royal Society for the Prevention of Accidents*).

The Oxford Minidictionary—as its performance on our dictionary test indicates—had problems dealing with words that were in any way out of the ordinary. In particular, the Minidictionary got very low scores for defining new words (*post-*

modern), foreign terms (*brioche*), business terms (*arbitrageur*), rare words (*oenology*), and terms from the arts (*scrim*). The Minidictionary doesn't include pronunciation guides, etymologies, or syllable breaks, nor does it support definition chaining, or wildcard or Boolean searches. Moreover, the entry words are restricted to British spellings, limiting the program's appropriateness for American users.

■ A Lexicon of Tools

Many of the writers' tools in this roundup are closely related to other products that bear different names—and often, very different prices. This list should help you sort out which programs are related to one another.

The American Heritage Dictionary, Second College Edition (AHD College): Much bigger than the Office Edition of The American Heritage Dictionary, this Houghton Mifflin Co. dictionary is available under the same name from WordStar International (by direct mail only) and is also included in Microsoft Bookshelf. This second edition of this dictionary will soon be replaced by the AHD Deluxe Third Edition.

The American Heritage Dictionary, Office Edition (AHD Office): This Houghton Mifflin dictionary is used in WordStar International's product of the same name and is also included in The Writer's Toolkit from Systems Compatibility Corp. A slightly larger version of the same Houghton Mifflin lexicon is used for WordScience's Instant Definitions Dictionary Two-Pack and SoftKey Software Products' Key Dictionary Plus.

The Concise Columbia Dictionary of Quotations: This is included in The Writer's Toolkit and in Microsoft Bookshelf.

Correct Grammar: This is a version of CorrecText, which was developed by Houghton Mifflin. It is published by WordStar International.

CorrecText: This grammar checker was developed by Houghton Mifflin. It

is sold as CorrecText in The Writer's Toolkit and also as a standalone product, Correct Grammar, available from WordStar International.

Definitions Plus: See *Instant Definitions Dictionary Two-Pack*.

The Dictionary of Common Knowledge: included in The Writer's Toolkit.

The Elements of Style: This style manual is part of the Infodesk series from Microlytics.

The Houghton Mifflin Abbreviation Program: Included in The Writer's Toolkit.

Houghton Mifflin Co.: This company developed CorrecText, Roget's II Electronic Thesaurus, and the Office and College Editions of The American Heritage Dictionary.

Infodesk: This is a series of programs from Microlytics with similar interfaces. It includes The Random House Encyclopedia and The Elements of Style.

Instant Definitions Dictionary Two-Pack: A dictionary whose name originally was Definitions Plus. This product is based on Houghton Mifflin's American Heritage Dictionary, Office Edition.

Key Dictionary Plus: This dictionary is based on Houghton Mifflin's American Heritage Dictionary, Office Edition.

Key Grammar Checker: This is an older version of RightWriter, and it is available from SoftKey Software Products.

Microsoft Bookshelf: A CD-ROM from Microsoft Corp. that includes among its programs The American

Heritage Dictionary, Second College Edition; Roget's II Electronic Thesaurus; The Concise Columbia Dictionary of Quotations; and also Bartlett's Familiar Quotations.

The Random House Encyclo-

dia: This encyclopedia is included in the Infodesk series from Microlytics.

RightWriter: A grammar checker. An older DOS version of this program is sold as Key Grammar Checker.

Roget's II Electronic Thesaurus: Used in AHD College, AHD Office, Microsoft Bookshelf, and The Writer's Toolkit.

The Writer's Toolkit: A package from Systems Compatibility Corp. that includes CorrecText, The American Heritage Dictionary, Roget's II Electronic Thesaurus, The Concise Columbia Dictionary of Quotations, The Dictionary of Common Knowledge, The Houghton Mifflin Abbreviation Program, and Written Word III.

Written Word III: This style manual is included in The Writer's Toolkit from Systems Compatibility Corp. □

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speakers. As well as a most exciting selection of CD software. All for less than you'd expect to pay if you bought the software alone. So don't. And don't buy a kit with software you don't want. We give you five of the hottest titles around. Compton's Multimedia Encyclopedia. Battle Chess Enhanced CD-ROM. Carmen Sandiego Deluxe. Mantis Experimental Fighter. And the winner of three Software Publishers

Awards. Civilization. Best of all, everything you need to get up and running is in the box. The sound card and software are simple to install. And you can even use your system to play music CDs. So remember. PC owners who look for value look for Fusion CD 16. Only from Media Vision.



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FACT FILE

Oxford Writer's Shelf, Version 1.0

Oxford University Press, Electronic
Publishing, 200 Madison Ave., New York,
NY 10016; 800-334-4249 ext. 7370,
212-679-7300 ext. 7370; fax, 212-725-2972

List price: \$119.

Requires: 640K RAM, 4MB hard disk space, DOS 2.0
or later.

In short: Oxford Writer's Shelf consists of a definitions
dictionary, a writer's dictionary, a quotations collection,
and a style manual. Most of these features, however,
are too underdeveloped to make this product as useful
as a number of competitive packages.



Oxford Writer's Shelf possesses an eccentric interface that is counterintuitive enough to seem awkward even after you learn the proper key combinations. The undersized pop-up screen, which is big enough for the very terse dictionary definitions, is too small to accommodate the more extensive explanations given in the style manual.

However, the main problem with the program is the limited range of the puny Minidictionary: Too often, it will waste your time because it doesn't list the word you're looking for. Unless your own vocabulary is similarly limited, you'll do well to skirt this mini.

WordPerfect Corp.

Random House Webster's Electronic Dictionary and Thesaurus, College Edition

Random House Webster's Electronic Dictionary and Thesaurus, College Edition—there are a lot of words in the title, but justifiably: There are a lot of words in the dictionary. Based on the complete text of the 180,000-entry, 1,565-page *Random House Webster's College Dictionary*, this was the program that placed highest in our dictionary testing, racking up a near-perfect score of 99



out of a possible 100 points.

This \$99 electronic dictionary and thesaurus was adept at furnishing definitions in every category of test words, including foreign terms, archaic words, and colloquial terms. It was able to define business terms such as *entrepot* and *Keynesian*, professional terms such as *hypoxia* and *decriminalization*, and rare words such as *intercalation* and *incunabula*. The only test item Random House Webster's missed was a new word, *demythify* (a verb meaning to rid of mythical aspects, which entered the language around 1965).

A HOUSE FULL

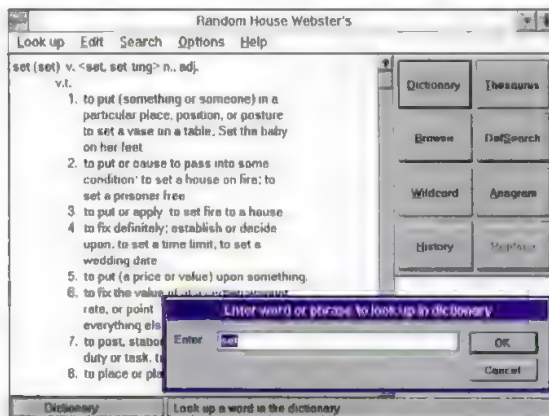
Random House Webster's delivers a lot of content for the dollar. Its entries are accompanied by part-of-speech notations, pronunciation guides, dates when words entered the language, etymologies, syllable breaks, and—for words with multiple meanings—short illustrative sentences. Its definitions are longer and more informative than those in MultiLex Professional Dictionary, which placed 6 points behind it on our test. Random House also had the better interface and, because of superior compression techniques, needed less hard-disk space than did MultiLex. In addition, Random House costs less and also needs less hard disk space than AHD, Second College Edition, which took third place on our dictionary test.

The product comes in both DOS and Windows versions and can be customized to work inside many popular word processors. It includes 11,000 biographical and geographical entries, as well as etymologies, pronunciations, usage notes, and listings of idioms. Random House offers a full range of the features found in good electronic dictionaries: Boolean searches, an anagram generator, and definitions chaining. If you're unsure about a term's spelling, you can look for it with a wildcard search; if you misspell a word, you'll be shown a list of correctly spelled alternatives. The Windows version of Random House also comes

with a browse feature that lets you display its entry words in alphabetical order.

SYNONYMOUS

The dictionary is integrated with a thesaurus based on the 812-page *Random House Thesaurus, College Edition*; its score on our thesaurus test was a middle-of-the-pack 57 points. The thesaurus



Random House Webster's Electronic Dictionary and Thesaurus offers definitions, synonyms, and anagrams.

gives antonyms, and instead of including short definitions to establish the sense of a group of synonyms, gives sample sentences—particularly useful for students and people learning English.

A simple command lets you move between the dictionary and thesaurus; you can easily get definitions of words in the thesaurus and synonyms of words in dictionary entries. But if you want to save hard disk space—about 1.4MB—you can install only the dictionary.



FACT FILE

Random House Webster's Electronic Dictionary and Thesaurus, College Edition

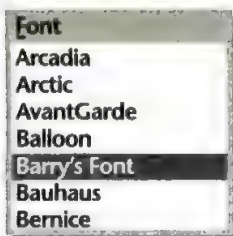
WordPerfect Corp., 1555 N. Technology
Way, Orem, UT 84057; 800-451-5151,
801-225-5000; fax, 801-228-5377

List price: \$99.

Requires: 9.4MB hard disk space. For DOS version:
435K RAM, DOS 3.0 or later. For Windows version:
2MB RAM, Microsoft Windows 3.0 or later.

In short: This dictionary combines the full contents
of a 1,500-page college edition with an excellent inter-
face.





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Autotrace your signature or any other scanned image—place it in a font and assign it to a keystroke.

Use the calligraphic or pressure-sensitive tool—as well as a full range of drawing tools to design your font from scratch.



Design and create a logo; then assign it to a keystroke.



Blend two fonts to create a third. Time taken to create: 2 minutes. Keystrokes required: 5.

abcdefghijklmnopqrstuvwxyz ABCDEFGHIJK
LMNOPQRSTUVWXYZ
Z.1234567890!@#:\$%^&
*0+?

This font "TFHabitat" was created in Fontographer by Joe Treacy of Treacyfaces, Inc.



Fontographer always opens a copy of your existing font, keeping your original intact.

Now shipping, with over one billion fonts.

Fonts are like money; the more you have, the more you're able to do. Just think what you could accomplish with an infinite number of fonts.

Fontographer for Windows, the type manipulation and design program from Altsys, gives you that.

And more.

Fontographer actually lets you open copies of your current fonts and—without drawing a thing—automatically modify characters and add new ones, turning your existing typefaces into entirely new personalized PostScript language and TrueType® fonts.

Logical one-step commands make font customization quick

and easy. With the Windows version of Fontographer, anyone can blend two fonts to make a brand new one. Vary italic angles. Autotrace scanned images to create new characters. Or instantly increase and decrease type weight.

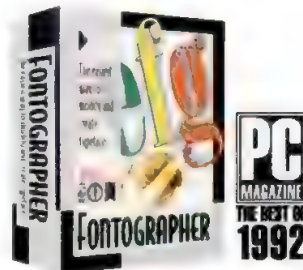
Fontographer also lets you incorporate graphics into your fonts. Imagine a company logo or your signature as a keystroke.

What's more, Fontographer's straightforward interface means you can be creative without being confused. In fact, the hardest part about using Fontographer may be dreaming up names for all your new creations.

But just in case you do need some help, we offer free, unlimited technical support.

According to Ed Mendelson of PC Magazine, "PC users... now have the most powerful and well-designed font-editing tool available on a desktop—and probably the easiest font-editing program available anywhere."

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CIRCLE 192 ON READER SERVICE CARD

► SUMMARY OF FEATURES

Writers' Tools with Dictionaries

Products listed in alphabetical order

■ = YES □ = NO

	The American Heritage Dictionary, Office Edition	The American Heritage Dictionary, Second College Edition	The Concise Oxford Dictionary, Electronic Edition	Funk & Wagnalls Standard Desk Dictionary	Instant Definitions Dictionary Two-Pack	Key Dictionary Plus	MultiLex Professional Dictionary and Thesaurus
List price	\$99.00	\$129.00	\$99.00	\$79.95	\$69.00	\$39.95	\$69.00
Number of words claimed in lexicon	116,000	245,000	149,000	100,000	116,000	116,000	170,000
Complete program size	3MB	11MB	4MB	5.6MB	2.5MB	2.3MB	12.4MB
Definition lengths	Short	Full	Medium	Medium	Short	Short	Medium
Reads directly from documents	□*	□*	■	□*	■	■	■
Copies into word processors	■	■	■	■	■	□	■
Windows version available	■	■	□	■	□	□	□
Includes thesaurus	■	■	□	□	□	□	■
Includes other modules	□	□	□	■	□	□	□
Includes idioms	■	■	■	■	■	■	■
Includes pronunciations	■	■	□	□	□	□	□
Includes etymologies	■	■	■	■	□	□	□
Shows syllable breaks	■	■	□	■	■	■	□
Includes geographical and biographical entries	□	■	□	■ (separate databases)	□	□	■
Reads hyphenated words	■	■	■	■	■	■	■
Supports definition chaining	■	■	■	■	■	■	■
Generates anagrams	■	■	□	□	□	□	□
Supports wildcard searches	■	■	■	■	□	□	□
Supports Boolean searches	■	■	□	□	■	□	□

* Reads from documents via the Windows Clipboard.

Some writers' tools (thesauri, for example) are so close in performance that it's hard to pick a winner. That's not the case here. Random House Webster's superiority in every category—power, interface, and extra features—makes it the best dictionary available on-disk.

Grammar Checkers

WordStar International Inc.

Correct Grammar for DOS

Correct Grammar for Windows

WordStar International's Correct Grammar (\$99) for Windows, Version 2.0, and Correct Grammar for DOS, Version 4.0, were based on the CorrecText grammar-checking engine developed by Houghton Mifflin. Therefore, the Correct Grammar software is very similar to the CorrecText grammar correction system that comes

with recent versions of Ami Pro and Microsoft Word. As indicated by its good False Flags score on our performance test, WordStar's product is adept at avoiding a common problem in grammar checkers: pointing out nonexistent errors. Both the DOS and Windows versions of Correct Grammar are fast, have clean interfaces, and will work with a large number of word processors. The program performed well except in detecting punctuation errors. Correct Grammar's success rate in that category was the lowest in its group.



IN WRITING

On the back of the Correct Grammar package, WordStar bets the full purchase price that the program will catch 95 percent of your grammar and spelling errors; however, no grammar checker can really do that well. In our performance tests, Correct Grammar successfully located 22

percent of the punctuation errors, 42 percent of the errors in style and grammar, and 74 percent of the spelling errors.

Another of WordStar's claims is that Correct Grammar's 135,000-word spelling dictionary is the largest available in any grammar checker. That may be so, but on our performance tests, the spell-checker that comes integrated with Grammatik 5 got a higher score. Correct Grammar's spell-checker is particularly strong, however, in recognizing abbreviations.

Many of the features in Correct Grammar are similar to those in other good grammar programs. There are controls that permit you to enter suggested corrections automatically and to add or suppress grammar rules on the fly. The program can also produce a readability report on your document, which includes statistics on such factors as grade level and average sentence length. If you need

Oxford Writer's Shell	Random House Webster's Electronic Dictionary and Thesaurus, College Edition	The Writer's Toolkit for DOS / for Windows
\$119.00	\$99.00	\$129.00
40,000	180,000	116,000
4MB	9.4MB	8.4MB
Short	Full	Short
☐	☒	☒
☒	☒	☒
☐	☒	☒
☐	☒	☒
☒	☐	☒
☒	☒	☒
☐	☒	☒
☐	☒	☒
☐	☒	☒
☒ (separate databases)	☒	☒ (separate databases)
☒	☒	☒
☒	☒	☒
☐	☒	☒
☒	☒	☒
☐	☒	☒

to know more about why a sentence was flagged, pushing a specified button will take you to a tutorial with more details. For most errors, however, this button can't be activated.

FACT FILE

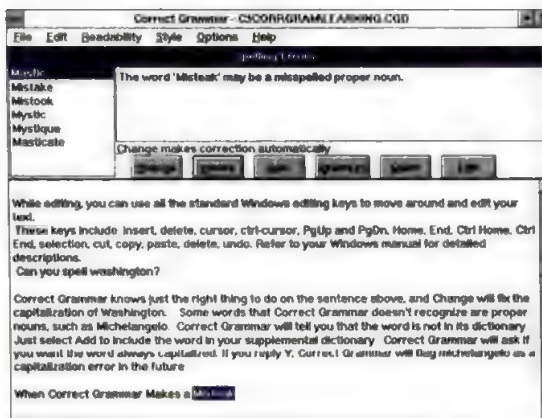
Correct Grammar for DOS, Version 4.0

**Correct Grammar for Windows,
Version 2.0**

**WordStar International Inc., 201 Alameda
del Prado, Novato, CA 94949; 800-523-3520,
415-382-8000; fax, 415-883-1629**

Requires: 2MB hard disk space. For DOS version: 512K RAM. For Windows version: 2MB RAM, Microsoft Windows 3.0 or later.

In short: Correct Grammar holds its own when handling typical problems in grammar, style, and spelling.



Correct Grammar is one of the programs that can search for spelling errors while doing grammar checking.

DON'T BE FOOLED

Unlike most spelling checkers we looked at in this roundup, Correct Grammar does not offer the ability to ignore a word that is not included in its lexicon. Instead, it automatically adds the word to its temporary dictionary and presents it each time an unknown, similarly spelled word appears.

Another drawback is that Correct Grammar won't allow you to go back to portions of your document that have already been covered. So if you change your mind about a particular correction you made a few pages back, returning to it requires a new scan from the top of the document.

Correct Grammar will read documents created by a wide variety of word processors. It has macro routines so you can use it inside Aldus PageMaker, Ami Pro, Microsoft Word for Windows, Windows Write, and WordPerfect for Windows.

In general, WordStar's Correct Grammar works well; if the program is not up to the level of Grammatik 5, it's close to or better than most other grammar checkers.

WordPerfect Corp.

**Grammatik 5 for DOS /
for Windows**

WordPerfect Corp.'s Grammatik 5—in both DOS and Windows versions—has long been a best-selling program, but it hasn't always been the top gun: In our

last set of head-to-head tests for grammar-checking programs (*PC Magazine*, September 24, 1991), Grammatik IV, Version 2.0, finished third. WordPerfect has since sent its programmers back to the drawing board, and their labors have paid off. Grammatik 5 (\$99) is not just better than the prior release, it is now the best grammar checker in its field.

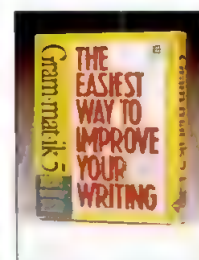
Grammatik 5's improvement can be attributed to the introduction of Mor*Proof, a new type of parsing engine. Mor*Proof contains a special

100,000-word dictionary based on morphemes (root words). When searching for a particular word such as *fighting* or *fought*, Mor*Proof does not scan an alphabetical list, but instead recognizes the word's relationship to the morpheme *fight*, and then searches on the word family to which both belong.

Grammatik 5 further parses by checking verb conditions such as transitive or intransitive, thereby establishing the part of speech for each word and using that data in determining a sentence's structure. An analysis of the parsed sentence, in turn, is what permits the grammar program to ascertain whether or not the sentence contains an error. One benefit of this approach is that the program can display the sentences in your document with their parts of speech labeled, which can be a valuable tool for students.

Grammatik 5's new parsing engine is probably what enabled it to rack up some of the highest numbers on our performance tests. The program's score for hits on the Punctuation test was significantly better than that of its nearest rival: 36 percent accuracy versus PowerEdit's 26 percent. Grammatik 5 was also better than rival programs at detecting stylistic and grammatical errors, although by a somewhat smaller margin.

Once it detects an error, a grammar program suggests emendations. We measured this ability in the advice por-



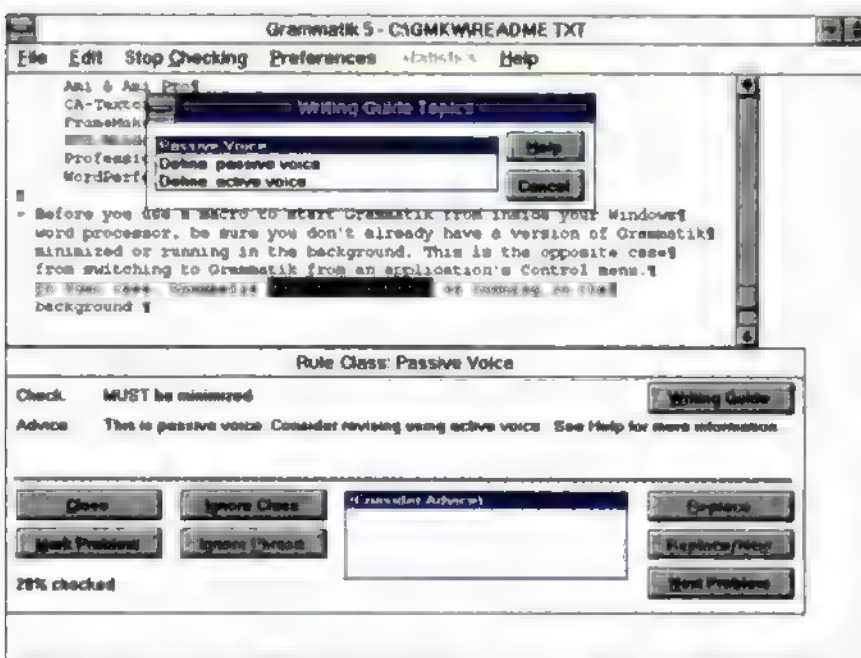
► SUMMARY OF FEATURES

Writers' Tools with Grammar Checkers

Products listed in alphabetical order

	Correct Grammar for DOS/for Windows	Grammatik 5 for DOS/for Windows	PowerEdit	RightWriter	The Writer's Toolkit for DOS/for Windows
List price	\$99.00	\$99.00	\$139.00	\$49.95	\$129.00
Hard disk space needed	2MB	2.2MB	10MB	2MB	2.9MB (for grammar module)
Windows version available	☒	☒	☒	☒	☒
Works with popular Windows word processors	☒	☒	☒	☒	☒
Can work as a standalone program	☒	☒	☐	☒	☒
Gives readability statistics	☒	☒	☒	☒	☒

☒ = YES ☐ = NO



Hitting Grammatik 5's Writing Guide button will bring in-depth advice on correcting the errors the program has flagged.

tion of our tests, and here again Grammatik 5 proved to be the best in its group. After detecting an error, Grammatik 5 gives you succinct but accurate suggestions about how to correct it. Its hits-to-false-flags ratio indicates that Grammatik 5 is the program least likely to bother you with suggestions for unneeded cor-

rections: You'll get, on the average, eight accurate corrections for every one that's wrong. Grammatik 5 also got the highest score on the spelling test.

Pushing Grammatik 5's Writing Advice button will bring a second level of context-sensitive suggestions when still more information is needed. In addition—a welcome touch—the Advice feature lists relevant page references in standard printed style manuals such as Strunk and White or the *APSE Shuttlecock*. Grammatik

5's documentation is also very good: The program comes with a 188-page manual as well as a 105-page handbook that explains how to create the custom error-checking style that best fits your personal needs.

SMOOTH OPERATOR

Grammatik 5 is a fast and attractive program that takes up a relatively modest 2MB of hard disk space. Available in both DOS and Windows versions, the program is compatible with most popular word processors. The Windows version has macros to let you start Grammatik 5 inside Ami Pro, Microsoft Word for Windows, or WordPerfect for Windows.

Grammatik 5 does have a few minor glitches: The spell-checker at times inappropriately capitalizes replacement words, underlining (needed to indicate italics) isn't supported, and you can't easily move about your document when

checking grammar. Even so, Grammatik 5 performs better than other grammar programs. Tomorrow's technology may bring that long-awaited dream, a grammar checker that will make copy editors worry about keeping their jobs. For now, however, Grammatik 5 takes you as far as you can go toward that dream.

Oracle Corp.

PowerEdit

PowerEdit, Version 2.1, is a big program; it requires 10MB of hard disk space—much more than any other grammar program. According to Oracle Corp., it's big in other ways, too: It uses 200,000 style rules and can recognize over a million different words and phrases. A 1991 *PC Magazine* Editors' Choice, the \$139 PowerEdit was, with this release, the second-best program at scoring hits on our performance tests.

That's the good news. The bad news is that the new PowerEdit has an unacceptably high false-flagging rate: Too often, it presents suggestions that are irrelevant, misleading, or just plain daffy. It once advised, for example, that we replace a supposedly incorrect word with the identical word. Given the sentence "Paul laugh at the joke," PowerEdit suggested that we replace *laugh* with the misspelled *laughes*. The advice messages are often much too vague ("difficult to read," "rewrite this sentence if the wording is odd or complex," "there may be poor wording elsewhere in the sentence"). This leaves the user with the task



► FACT FILE

Grammatik 5 for DOS / for Windows

WordPerfect Corp., 1555 N. Technology Way, Orem, UT 84057; 800-451-5151, 801-225-5000; fax, 801-228-5377

List price: Either version, \$99; upgrade, \$34.99.

Requires: 2.2MB hard disk space. For DOS version: 640K RAM, DOS 3.0. For Windows version: 2MB RAM, Microsoft Windows 3.0 or later.

In short: This package, with its sentence-parsing technology, was the best grammar checker we tested.

465 ON READER SERVICE CARD

► SUMMARY OF FEATURES

Writers' Tools With Thesauri

Products listed in alphabetical order

■ = YES □ = NO

	The American Heritage Dictionary, Office Edition	The American Heritage Dictionary, Second College Edition	MultiLex Professional Dictionary and Thesaurus	Random House Webster's Electronic Dictionary and Thesaurus, College Edition	Word Finder Plus for Windows	The Writer's Toolkit for DOS/for Windows
List price (thesaurus only)	N/A	N/A	\$29.00	N/A	N/A	N/A
List price (full program)	\$99.00	\$129.00	\$69.00	\$99.00	\$59.95	\$129.00
Hard disk space (thesaurus only)	N/A	N/A	2.9MB	N/A	N/A	1MB
Hard disk space (full program)	3MB	11MB	12.4MB	9.4MB	512K	8.4MB
Includes dictionary	■	■	■	■	□	■
Clusters synonyms by meaning	■	■	■	■	■	■
Provides antonyms	□	□	■	■	□	□
Supports synonym chaining	■	■	■	■	■	■
Supports wildcard searches	■	■	□	■	□	■
Reads hyphenated words	■	■	■	■	■	■

N/A—Not applicable. The thesaurus is not sold separately.

that the program should perform: identifying and correcting the problems.

BAD ADVICE

PowerEdit is the only program we tested whose hits-to-false-flags ratio was lower than 1:1, meaning you'll get more bad advice than good. It detected 90 of the 250 errors in our test script (36 percent), but in doing so found 102 nonexistent mis-

more acceptable 11 percent, but the hit rate dropped concomitantly to a very low 20 percent (51 out of a possible 250 hits). If you want PowerEdit to track down the maximum number of errors, you'll have to put up with a lot of false flagging.

Another drawback is that PowerEdit, unlike rival programs, lacks a full spelling program; instead, it checks your text against a relatively short list of 7,500 commonly misspelled words. You'll have to scan your documents twice: once using your word processor's spell-checker and again using PowerEdit.

NARROWER FIELD

In its original DOS release, PowerEdit worked as a stand-alone program and could read files created by many word processors. The current version works only with recent releases of Microsoft Word for Windows and WordPerfect for Windows; an Ami Pro version should be ready shortly. If

you're familiar with these word processors, you know that their latest releases already contain integrated grammar checkers. Word for Windows and Ami Pro use CorrecText—the same program Correct Grammar uses—and WordPerfect for Windows uses Grammatik 5; these grammar programs are as good as PowerEdit or better. This raises a troubling question: Why buy PowerEdit

► FACT FILE

PowerEdit, Version 2.1

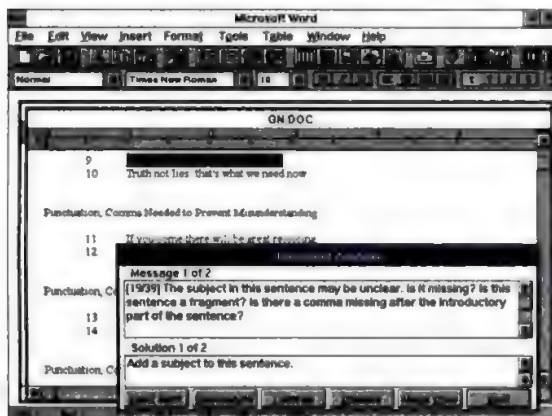
Oracle Corp., 5221 N. O'Connor Blvd.,
#1400, Irving, TX 75039; 800-800-4254,
214-699-1913; fax, 214-869-2895

List price: \$139

Requires: 386-based PC or better, 4MB RAM, Microsoft Windows 3.0 or later, Microsoft Word for Windows or WordPerfect for Windows

In short: While PowerEdit 2.1 can find many of the errors in your documents, it'll also flag those you never made

 ON READER SERVICE CARD



When PowerEdit is working, its document analysis window pops up inside your Windows word processor.

takes, for an average false-flagging rate of 41 percent. The program will waste your time by making you think about which of its advice messages to take seriously.

PowerEdit's false-flagging rate was at its highest when we used its Custom setting, recommended by Oracle for these tests. With the program's Business Quick Check setting, the rate went down to a

when your word processor already has a grammar checker that's at least as good?

PowerEdit is a sophisticated program and doubtless will be improved; its publishers have been working hard to make it the biggest and best in its field. At the moment, however, they've achieved only the first of these goals.

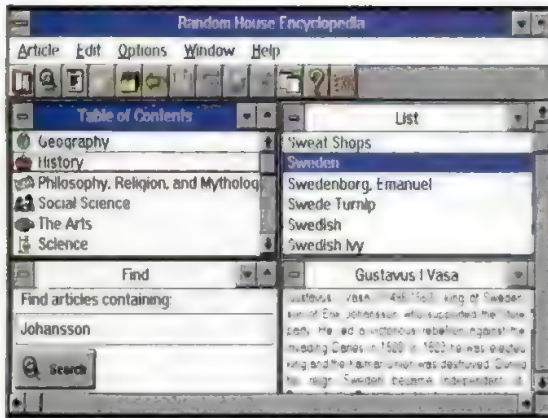
Microlytics Inc.

The Random House Encyclopedia for Windows

If you're familiar with the printed version of the one-volume *Random House Encyclopedia*, you know that it's divided into four sections: the Colorpedia, a series of illustrated essays on selected topics; the

SOFTWARE

Writers' Tools



The Random House Encyclopedia for Windows provides you with many different ways of finding information.

Time Chart, a chronological outline of human history; the Alphapedia, a series of short articles covering a broad range of subjects presented in alphabetical order; and a world atlas. The electronic version of *The Random House Encyclopedia* (\$99.95) is based on the 50-page Time Chart and the 885-page, 25,000-entry Alphapedia. This data is compressed so that the encyclopedia needs 4.5MB of hard disk space, a modest amount for a program of this magnitude.

Is getting an electronic encyclopedia worthwhile? To be sure, it can save you time when you're looking up or copying information, but that's only half the story. What makes *The Random House Encyclopedia* valuable is the performance of its retrieval engine. If you were looking for material on Abraham Lincoln in a printed encyclopedia, you could easily



find an article under his name, but the discussions about him in other articles would be much harder to find. With *The Random House Encyclopedia* you can conduct a search of the entire reference, and you'll find no fewer than 30 articles referring to Lincoln. If that's too much of a good thing, you can use a Boolean search to narrow down your topic.

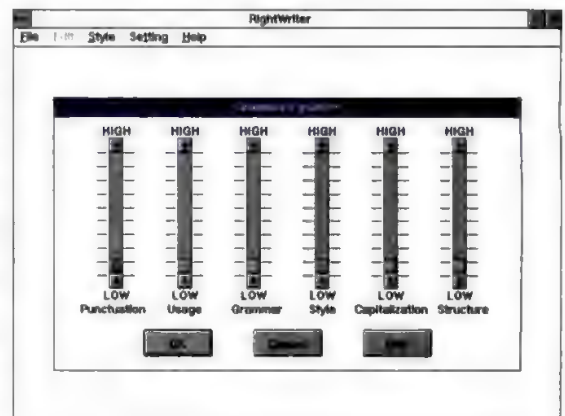
In the Windows release of *The Random House Encyclopedia*, all of these options are available as toolbar buttons or menu items. As a result, working with the program is so simple that you'll be up and running without even a peek at the manual. Another bonus feature is the ability to open multiple windows; this is particularly useful when you want to display a number of articles on related topics simultaneously. It's also possible to have the same function running in more than one window; you could look at two sections of the list of article titles or at the results of a number of global searches.

The articles are shorter than those in some one-volume encyclopedias; *The New Columbia Encyclopedia*, for exam-

ple. They're also shorter than those in the Grolier and Compton's encyclopedias, multimedia CD-ROM programs that offer the full contents of multivolume printed encyclopedias and come with photographs, sound, animation, and video clips. (For more information see *PC Magazine*, December 22, 1992.) But if you're an information junkie and don't own a CD-ROM player, the obvious answer is *The Random House Encyclopedia*. It is fast, has a huge database, and—especially in its Windows release—is a breeze to use.

Que Software **RightWriter**

Que Software's *RightWriter* has come a long way. When it first appeared, *RightWriter* was hardly the program of choice. Less powerful than other grammar checkers, it couldn't operate in an interactive editing mode, lacked an integrated spell-checker, and came with a drab interface. In its latest incarnation, however, *RightWriter* chalked up some downright respectable scores on our performance tests. Available in both DOS and Windows versions (\$49.95 each), *RightWriter* now can work interactively as well as in document mark-up mode; it comes with an integrated spell-checker,



RightWriter's Grammar Equalizer adjusts error checking through an interface that resembles a graphic equalizer.

and it has a more attractive interface.

Que claims to have added more powerful parsing rules to the new version of *RightWriter*, and our tests indicate that this is so. *RightWriter's* 25 percent score for hits on our Punctuation test puts it

FACT FILE

The Random House Encyclopedia for Windows

Microlytics Inc., 2 Tobey Village Office Park, Pittsford, NY 14534; 800-828-6293, 716-248-9150; fax, 716-248-5659

List price: \$99.95.

Requires: 2MB RAM, 4.5MB hard disk space, Microsoft Windows 3.1 or later

In short: The new Windows release of *The Random House Encyclopedia* gives you all the information in the DOS version plus an easy-to-use interface



ON READER SERVICE CARD

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Price: \$19.95

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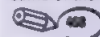
RightWriter, Version 6

Que Software, 11711 N. College Ave.,
Carmel, IN 46032-5634; 800-992-0244,
317-573-2500; fax, 317-573-2655

List price: DOS and Windows versions, \$49.95 each.

Requires: 1MB RAM, 1.2MB hard disk space. For DOS version: DOS 3.0 or later. For Windows version: Microsoft Windows 3.0 or later.

In short: RightWriter's scores on our performance tests put it close to—and in certain categories ahead of—some of the other leading grammar checkers.



ON READER SERVICE CARD

ahead of Correct Grammar and just behind PowerEdit. It beat both of these programs to place second (behind Grammatik 5) in the category that judged the quality of its advice on punctuation-error corrections. While inferior to these programs in scoring hits on the Style and Grammar test, it was behind by only a small number of points.

RightWriter's 12 percent average false-flagging rate, while much better than PowerEdit's (41 percent), was not as good as that of Correct Grammar and Grammatik 5 (both averaged 5 percent).

Checking for spelling errors is the only area where RightWriter needs to catch up, especially in dealing with professional and technical terms, words of foreign origin, and abbreviations. Its 48 percent success rate on our Spelling test was significantly behind those of Correct Grammar (74 percent) and Grammatik 5 (80 percent). Although RightWriter is in general easy to use, we had some problems getting it to run inside Ami Pro and Microsoft Word for Windows 2.0.

RightWriter has a couple of attractive features you won't find in some other programs. One is its grammar equalizer. This is a series of controls designed to look like the graphic equalizer on a stereo system. By sliding the controls up and down, you can increase the number of style rules that are invoked or decrease them, if you want to diminish the rate of



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Floppy Drive	2	2	2	2	1
Monitor	14"***	14"	15"	14"	15"
DOS, Windows	Y	Y	Y	Y	Y
Mouse					
Application SW	Y	N	Y	Y	N
Price	\$2,495	\$3,569	\$2,995	\$2,775	\$3,119

*Prices quoted 2/3/93 **15" monitor, add \$150

There's no comparison. CompuAdd Express offers you more features and saves you more money. And that really adds up. Especially when you include our highly regarded service package. It's standard with all our systems. And it includes Remote Rescue with Close-Up 4.0 for online technical support. Plus all this: a 30-day money back guarantee, Express 30-day exchange, one-year limited warranty, one-year onsite service, rapid repairs, toll-free lifetime technical support, technical bulletin board service, the convenience of Express leasing, and easy credit when you have an Express credit card. Add it all together, and you'll agree, CompuAdd Express gives you more for less.



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- Local bus video
- Dual floppy drive
- Low profile chassis
- 128K cache
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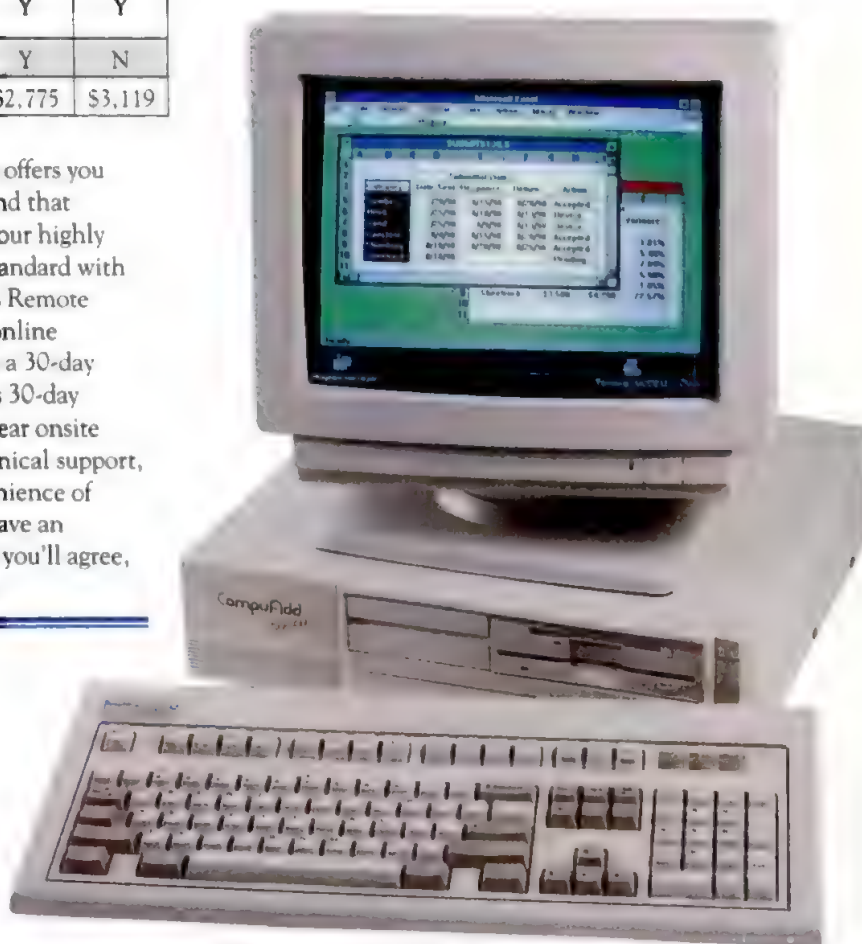


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SOFTWARE

Writers' Tools

false flagging. The other feature is one that neither Correct Grammar nor Grammatik 5 shares: the ability to back up through a document or start grammar checking anywhere you want.

Programming for grammar checkers is a notoriously complex and challenging task. RightWriter may still have some distance to go, but it has made dramatic strides since our last roundup of writers' tools.

Systems Compatibility Corp.

The Writer's Toolkit for DOS / for Windows

The Writer's Toolkit, Version 2.0 for DOS, and The Writer's Toolkit, Version 2.0 for Windows, are collections of seven integrated programs, a number of them versions of products that are well known in their standalone releases. The programs in each of the collections are Houghton Mifflin Co.'s CorrectText grammar-checking system; The American Heritage Dictionary, Office Edition; Roget's II Electronic Thesaurus; The Concise Columbia Dictionary of Quotations; The Written Word III—Principles of Grammar & Style; The Dictionary of Common Knowledge; and The Houghton Mifflin Abbreviation Program.

The CorrectText grammar checker that The Writer's Toolkit uses is similar to WordStar International's Correct Grammar program. The American Heritage Dictionary is the same as WordStar's American Heritage Dictionary, Office Edition, and the thesaurus is the one that's bundled with WordStar's American Heritage Dictionary. The Concise Columbia Dictionary of Quotations is included on Microsoft's Bookshelf a CD-ROM. The Dictionary of Common Knowledge is a general information handbook based on excerpts from *The Dictionary of Cultural Literacy*. The Houghton Mifflin Abbreviation Program is, as its name suggests, an abbreviations dictionary.

At first sight, this giant software grab

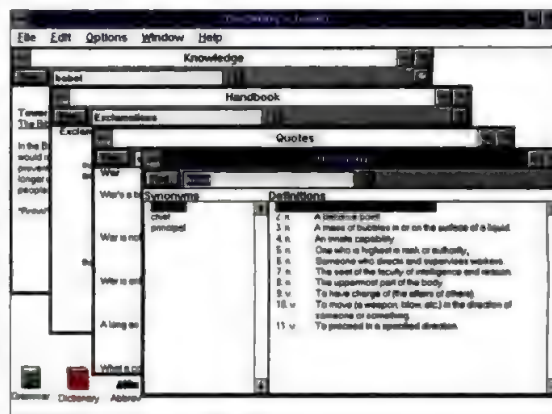
bag looks like a steal: seven programs for \$129, less than you might pay for standalone versions of two of them. There are some minor drawbacks, however: Some of the programs, such as Roget's II, aren't exactly cutting-edge technology, and some of the others don't always work quite as well as their standalone counterparts.

For example, the grammar checker's inability to deal with sentences of over 60 words led to a higher false-flagging rate than in the standalone Correct Grammar, which doesn't have that problem. The Writer's Toolkit's dictionary, based on Houghton Mifflin's AHD, Office Edition, got a slightly lower score than Instant Definitions Dictionary Two-Pack and Key Dictionary Plus. This is probably because it uses a release of the AHD that has a smaller lexicon file (1,935K versus 1,998K for the other programs).



A TOUCH OF STYLE

The Writer's Toolkit's style manual, The Written Word III, is handy for dealing with questions about usage in greater depth than the package's grammar checker. The 6,000-item Concise Colum-



The Windows version of The Writer's Toolkit lets you display the program's modules on-screen and tab from one to another.

bia Dictionary of Quotations is, as the title suggests, concise, but you'll find it convenient to have the program search for quotations by author or subject. The Dictionary of Common Knowledge is hampered by the lack of a detailed index.

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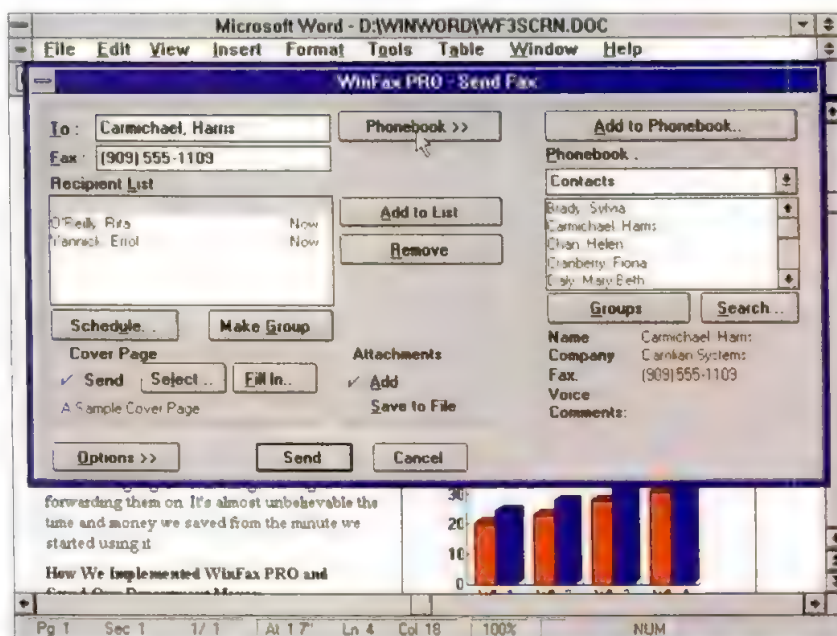
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CIRCLE 250 ON READER SERVICE CARD

FACT FILE

The Writer's Toolkit, Version 2.0 for DOS / for Windows

Systems Compatibility Corp., 401 N. Wabash, #600, Chicago, IL 60611; 800-333-1395, 312-329-0700; fax, 312-670-0820

List price: DOS and Windows versions, \$129 each

Requires: For DOS version: 512K RAM, 10K RAM for TSR, 7.3MB hard disk space, DOS 2.x or later. For Windows version: 1MB RAM (2MB recommended), 8.4MB hard disk space, Microsoft Windows 3.0 or later.

In short: A collection of integrated tools and reference works, The Writer's Toolkit, from Systems Compatibility Corp., offers an economical way of getting seven useful programs for about the price of two of the standalone versions



Without an overview of what's contained in the database, you'll have to type in items to see whether they're listed, and they often aren't.

The Writer's Toolkit has a good interface, and it's easy to go from one module of the program to another. There's a lot of utility crammed into this 8.3MB package, and slightly superannuated technology is often much better than no technology at all. If you're a discount-hunting, bazaar-bargaining type of shopper, The Writer's Toolkit may be for you.

Microlytics Inc.

Word Finder Plus for Windows

Microlytics' Word Finder Plus for Windows (\$59.95) claims to have over 1 million synonyms—as many as a printed thesaurus like *Rodale's Synonym Finder* advertises. But Word Finder can't really match the power of *Rodale's*.

A typical example of this is the number of synonyms each thesaurus provides for common words like *pile* and *reach*: Word Finder has 41 and 53, respectively, and *Rodale's* has 197 and 140. In addition, Word Finder's test score was only marginally higher than that of MultiLex



Thesaurus, which claims 280,000 synonyms. Moreover, Word Finder at times repeats the synonyms in an entry; for example, the nouns *store* and *stockpile* and the verb *heap* all appear twice in the synonym listings for *pile*. Thus the number of unique synonyms for *pile* that Word Finder supplies goes down to 38.

IN OTHER WORDS

Even so, our test indicated that Word Finder does have more synonyms than any other electronic thesaurus. Although MultiLex was a close runner-up in terms of the number of synonyms, Word Finder's accuracy in defining legitimate synonyms was much better. The DOS version of Word Finder is still one of the strongest on the market, with the added advantage of good compatibility with a large range of word processors. The new Windows version brings to these qualities a larger store of synonyms, compatibility with Windows word processors, and an easy-to-use, attractive interface.

WORDSMITHING

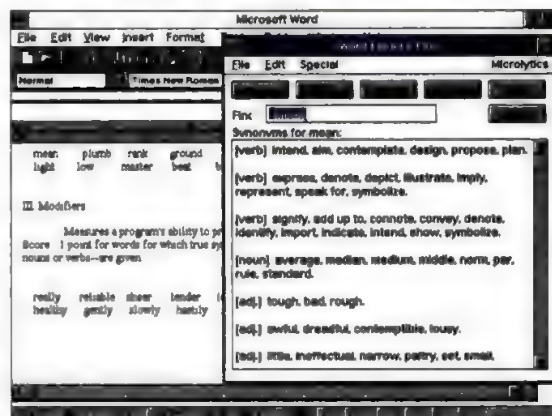
Word Finder got its best test results when it was asked to supply synonyms for common words, colloquial terms, and common modifiers. Some of its lowest success rates were for dealing with professional terms and foreign words that recently entered the English language.

Like most good electronic thesauri, Word Finder clusters synonyms by parts of speech. It will also give you short definitions—really little more than precise synonyms—for some 50,000 words. That's hardly a huge number, but it may be helpful if you don't own an electronic dictionary program. Word Finder can read the word at the cursor in many word processors, and, with many programs, it can also replace the word with the synonym you choose.

When Word Finder has no synonyms for a term, it lists similarly spelled words and asks you to choose one. You can go back to previous words you looked up and, if you wish, test your vocabulary with a quiz.

IMPERFECT WORDS

Although generally easy to use, Word Finder has a few cumbersome procedures. Installation isn't automatic: You need to create a directory and copy the program into it and—in the Windows version—go through the New Program Group procedure in the Program Manager to get the program running. Working with the Windows version of Word



Word Finder Plus for Windows can supply synonyms in addition to those your Windows word processor provides.

Finder would be more efficient if it could read highlighted words directly from other programs; instead, you need to Alt-Tab out of whatever other program you are working in and click on a Word Finder Import button.

Microlytics' Word Finder is a simple program with few frills; unlike some thesauri, it doesn't supply antonyms. But if you're looking for a program that has a considerable, extensive, and sizable stockpile of accurately defined synonyms, this is it. □

FACT FILE

Word Finder Plus for Windows

Microlytics Inc., 2 Tobey Village Office Park, Pittsford, NY 14534; 800-828-6293, 716-248-9150; fax, 716-248-5659

List price: \$59.95

Requires: 1MB RAM, 500K hard disk space, Microsoft Windows 3.0 or later

In short: A standalone thesaurus, Microlytics' Word Finder Plus for Windows is—in spite of some of its flaws—one of the best electronic thesauri available today



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PEER-TO-PEER LANs

Teamwork Without Trauma

You've heard of them before: Peer-to-peer networks, those easy-to-use connections whose vendors promise will link your PCs, printers, and CD-ROMs at a fraction of the cost of Microsoft LAN Manager or Novell's NetWare. Requiring only a few minutes to install and with no need for a dedicated administrator, peer-to-peer LANs are undeniably appealing. With one of these LANs, anyone can create his or her own network. And now with the emergence of Microsoft Windows for Workgroups, the peer-to-peer LAN market is poised for an explosion.

Can these products be for real?

You bet. With many of the new LANs being installed into small (10-to-20 node) workgroups, peer-to-peer LANs often offer the perfect solution. And when configured with robust operating systems such as Windows NT or OS/2, these products can even compete with more powerful network operating systems (NOSs) such as Banyan's VINES, DEC's PathWorks, IBM's LAN Server, Microsoft LAN Manager, or Novell's NetWare.



Peer-to-peer LANs promise a cheap and easy way to network your computers and share files and peripherals. But is that enough for your company?

by Frank J. Derfler, Jr.

New Windows front-ends make these products easier to use and administer than before. But even with the simplicity of Windows, peer-to-peer LANs still have a way to go. Some, such as Windows

for Workgroups, are simple to install but lack support for non-Windows environments. Other products, such as Webcorp's WEB for Windows and DOS, may support DOS clients but lack support for encrypted passwords when connecting to a NetWare file server.

While small workgroups may find that these and other peer-to-peer LANs offer the basic functionality they need, corporate network managers must carefully evaluate the impact that peer-to-peer LANs will have on information infrastructures. Giving users the ability to create their own networks makes administration, security, and network backups far more difficult.

THE NOS MARKET

Still, being able to install a network in minutes, not hours, is an asset for small and large workgroups alike. These products fall into the middle of the LAN market's four basic product categories.

At the most basic level are zero-slot LANs and printer-sharing devices. These products use serial or parallel links to move files between PCs and share peripherals.

Proprietary peer-to-peer LANs form the second level. These products use proprietary techniques for connecting devices to cabling, rather than using ARCnet, Ethernet, or Token-Ring. With proprietary techniques, these products can further reduce the cost of peer-to-peer LANs, but in so doing they limit your purchasing options by locking you into a vendor's card-and-cabling scheme. They typically run as low as \$60 per seat.

All the products we review are in the third level. These are peer-to-peer LANs that use Ethernet or Token-Ring standards to share disk drives, printers, and CD-ROMs. Virtually all of these prod-

ucts use standard DOS as the underlying file system. A per-node cost of less than \$300 (assuming a ten-node network) is typical.

"Dedicated-server-only" or "server-

centric" network systems are at the high end. The products in this category include the various versions of Banyan's VINES as well as Novell's NetWare.

Even within this category, though, you'll find a lot of

variety. Microsoft LAN Manager, for example, allows peer-to-peer resource sharing but is still considered a high-end NOS.

Dedicated-server NOSs are fast and offer industrial-strength security, sophisticated management reporting, and increasingly powerful naming schemes that enable users to find and use resources

easily across enterprise networks.

Because of the sophistication of these products, their vendors typically rely on dealers to sell and install them and support customers. Pricing on these products ranges dramatically, but substantial upfront and long-term costs are typical. Investing more than \$10,000 in the hardware and software for one dedicated server isn't unusual.

When you need to expand the LAN, you'll face an investment of additional thousands of dollars. If you have more than a few dozen users in a dedicated-server network, you'll probably need a full-time system administrator.

REVIEW CRITERIA

In this review, we looked at peer-to-peer LANs that offer a Windows interface for administration and mail. We also chose a standard Ethernet cabling scheme as a base requirement. Ethernet, particularly when running over thin-coaxial cabling, is probably the least expensive of the high-speed connections for PCs. It's also

Suitability to Task

Most peer-to-peer LANs include not only the capabilities that are found in larger LANs but functions such as e-mail and, in some cases, scheduling as well.

Communications capabilities include communications between users on the peer-to-peer network, which entail e-mail and chat utilities, as well as communications between separate networks, which entail network interoperability. Peer-to-peer networks excelling at communications will offer single-node and multinode chat utilities, along with lists of current users available for chats. They will also include e-mail, which lets users send, store, and forward messages; send attachments; and edit mail on-line. Alternatively, they will hook to a full-fledged e-mail package such as cc:Mail. These networks will also connect to Microsoft LAN Manager and NetWare networks with ease.

Resource sharing involves each package's ability to share Windows applications (such as Microsoft Excel and Microsoft Word for Windows) across the network. We also tested each package's ability to share a printer and a CD-ROM drive, the peripherals most commonly shared among network nodes. The

SUITABILITY TO TASK				
Product Name				
	POOR	FAIR	GOOD	EXCELLENT
Communications	●	○	○	○
Resource sharing	●	●	○	○
Small-office usage	●	●	●	○
Small-office usage	●	●	●	●

best packages offer such options as network-based DDE (Dynamic Data Exchange), as well as directory-, subdirectory-, and file-level security features for software and similarly strong security for peripherals. Packages should also be able to alert users when a node offering a shared resource leaves the network.

Small-office usage requires many of the features we looked for in the above categories, along with print-queue management, server management, and Windows utilities. Since dedicated network-support staffs are rare in small offices, ease of maintenance, setup, and use is absolutely essential. Outstanding products offer the option of setting up the types of security and management features found in large file-server packages such as NetWare but present them in a format that is easily understood by less experienced users. Packages should also let users set up less stringently controlled networks.

one of the easiest to install. Networks based on thin-coaxial cabling, however, become difficult to administer as the network grows.

Several vendors, such as Artisoft and Microsoft, offer starter kits that include all the software and hardware you will need to network a few PCs. (The number you can network depends on the particular kit.) Because these kits are often the simplest way to connect a few PCs, we opted wherever possible to test the network software and hardware contained in the kit instead of using hardware from a different source.

The products from Novell and Webcorp were the only exceptions to this rule. These companies license their software to several hardware manufacturers, which offer starter kits. Instead of testing the licensees, we opted to test the software from the source.

Not all of the standard peer-to-peer LAN products on the market offer a Windows interface for administration and communication. Many offer a DOS client. Though you typically can still run Windows and connect to the network with NOSs that have DOS-only front-ends, you cannot use the products' administration tools to manage the network, nor can you communicate with other users through Windows.

One of the peer-to-peer products, POWERlan from Performance Technology, integrates with Windows for Workgroups. POWERlan, which received an Editors' Choice designation in each of the past two years, is reviewed in the sidebar "Team Player." Another sidebar, "Peer-to-Peer LAN Alternatives," provides information on other DOS-based and proprietary LANs.

EASY INSTALLATION

The biggest advantage peer-to-peer LANs offer is ease of use. It generally takes no more than 2 or 3 minutes to

WE REVIEWED SEVEN peer-to-peer LANs. All provide a Windows interface through which network administrators can manage the network. None require proprietary hardware.

MICROSOFT Windows for Workgroups is best for Windows/LAN integration, which comes as no surprise. But the product falls flat trying to integrate PCs running DOS. If your network has PCs running DOS, you might want to use POWERlan, 10NET, or SilverNET to link them to a Windows for Workgroups LAN.

EASE OF USE is a main concern with these products, and all of them set up in minutes. The easiest product to install is Windows for Workgroups, which auto-senses much of the required data.

install the peer-to-peer networking software on a PC—even on the computer that will act as a file server. Dedicated-server products, on the other hand, can demand an hour of disk shuffling to install, even from someone experienced in the installation process.

And PC vendors are starting to make networking, and installation in particular, even easier. They are now selling PCs equipped with wireless LANs and peer-to-peer networking. Such PCs require no adapter installation or cable connections. Simply turn on the PC and presto: You've got a peer-to-peer LAN. AST Research recently announced an offer that combines Proxim's wireless network with Windows for Workgroups.

Wireless networks do have problems, most notably bandwidth, but for small

HIGHLIGHTS

Peer-to-Peer LANs

EXPANSION COSTS are incremental. You can easily add nodes without purchasing a license for each individual client. In contrast, client/server network operating systems typically require a licensing fee for each set of clients added to a server.

THESE PRODUCTS are more effective at sharing printers and CD-ROMs than more expensive server-based networks. Each offer CD-ROM sharing, and most have excellent printing utilities.

CROSS-PLATFORM computing is easily accomplished with peer-to-peer LANs. The most up-to-date packages offer users links to Macintosh computers, as well as to dedicated servers running NetWare or LAN Manager.

groups that primarily use the network to transfer files, the problems should be minimal.

When you must install network adapters, the hardest task, we found, is likely to be finding an open IRQ line for the LAN adapter board—something no networking software product can help you with. Other installation and configuration problems, as well as product updates and other general product information, are handled by all of the companies through free technical support lines and bulletin board systems.

THE PEER ADVANTAGE

Ease of use is not the only benefit of peer-to-peer LANs. We find they also share CD-ROM drives and printers as well or better than their server-based competitors. Server-based products typically require adding third-party packages, costing \$700 or more, but the ability to network a CD-ROM drive comes this capability comes standard in all the peer-to-peer products in this review.

Anyone who has ever set up NetWare print queues and print servers knows what a detailed process manipulating

Our Contributors: FRANK J. DERFLER, JR., is the senior networking editor of *PC Magazine*. JOE SALEMI is a contributing editor to *PC Magazine*. CONSTANTINE FOTOPOULOS is a support technician at *PC Magazine*. PADRAIC BOYLE is senior networks analyst for Ziff-Davis Publishing Co. and a frequent contributor to *PC Magazine*. STEVEN C.M. CHEN is a certified NetWare engineer who also runs CCM Consulting, a network consulting firm. STEVE RIGNEY is a network consultant and a frequent contributor to *PC Magazine*. DAVID GREENFIELD was the associate editor in charge of this story, and RICHARD BRADY was the project leader.

PRINTER and PSERVER is. Linking queues to designated printers requires a frustrating trip through layers of menus.

Peer-to-peer systems make it easy to use any printer attached to any PC as a shared network printer. Among the products in our roundup, Artisoft's LANtastic, Microsoft Windows for Workgroups, and Tiara Computer Systems' 10NET do a particularly good job of controlling and simplifying network printing. These products offer better control of the print jobs and more printing options than you'll find on dedicated-server networks.

CONNECTING TO OTHER ENVIRONMENTS

Although simple, the products in our review do connect with other environments. Vendors accomplish this in one of two ways: They either configure a computer as a gateway to translate between two environments or they establish a suite of network protocols that are compatible with other products. The gateway technique requires the installation of another networked computer, but no special hardware or software is needed on the client PCs. The technique of using compatible protocols keeps everything simple, but protocol compatibility is relative—incompatibility is always potentially one software release away. Artisoft, Performance Technology, and Tiara each offers an optional gateway that links a network running its product's software to Macintosh computers running AppleTalk.

The products from those three companies, plus those from Microsoft, Novell, and Webcorp can also link to a NetWare server. Windows for Workgroups includes a NetWare protocol stack for connection to a NetWare server; the protocol stack on WEB for Windows and DOS mirrors NetWare; and Novell designed NetWare compatibility into NetWare Lite. NetWare connection alternatives are extra-cost options in the other products. The products from Microsoft, Net-Source, Performance Technology, and Tiara can interact with LAN Server, Microsoft LAN Manager, and other network operating systems using SMB (Server Manager Block) protocols over NetBEUI-



EDITORS' CHOICE

• LANtastic, Version 5.0

It seems as if this category's Editors' Choice never changes, but the exact opposite is true: The peer-to-peer LAN market has seen tumultuous change over the past year, with the ascendancy of GUI LANs in general and Microsoft Windows for Workgroups in

particular. Some of last year's contenders and even one of last year's Editors' Choices (Performance Technology's POWERlan) lacked GUI front ends and were not eligible for this roundup.

Artisoft's mighty LANtastic once again rules the roost. This is a peer-to-peer network for the real world; it quickly and reliably brings DOS, Macintosh, Microsoft LAN Manager, Microsoft Windows, and NetWare systems into the interoperability fold.

Two products deserve an honorable

mention, each for a different reason. Tiara Computer Systems' 10NET combines excellent speed with flexible, powerful security. And though Invisible Software's InvisibleLAN is weak in security, it presented excellent speed in both dedicated and nondedicated modes because of its unique caching.

Microsoft Windows for Workgroups presented us with a difficult problem. If your office is Microsoft Windows-based, now and forever, this product is a brilliant choice. But if you're likely to

based (NetBIOS Extended User Interface) products.

NETWORK MANAGEMENT

The lack of sophisticated management tools makes peer-to-peer systems simpler to use in small networks, but less appropriate for large networks. Reporting on the activities of users or the status of resources, for example, is weak. The latest version of LANtastic has added some of those management capabilities without losing much of its simplicity. LANtastic can now produce reports showing such activities as what files users have opened, the number of files they have opened, and the amount of disk space they are using.

But network management involves more than merely reporting: Network security is another vital area. In all of the reviewed products except LANtastic, network security consists of nothing more than assigning a password to the directory and subdirectories of a hard disk. The latest release of LANtastic offers a security system, which is similar in concept to NetWare's, that organizes users into groups and then assigns specific

rights to those groups.

But all of the peer-to-peer systems allow anyone sitting at the keyboard of a particular computer to have full access to all the files stored on that PC, regardless of the extent of that user's network rights. If security is a problem, you should store sensitive files on-disk or limit physical access to the PC.

WINDOWS INTEGRATION

Networking your PCs under Windows involves some penalties. Before loading Windows, all of the reviewed products load network drivers, so your DOS sessions under Windows lose some memory. InvisibleLAN, 10NET, and Windows for Workgroups each comes with its own memory-management utilities; all of the programs reviewed here provide additional flexibility by offering compatibility with third-party memory managers.

How much DOS conventional memory space the NOSs use depends a lot on the configuration of the PC. Windows for Workgroups uses about 14K, depending on the LAN adapter-card drivers; LANtastic can consume be-

Peer-to-Peer LANs

put DOS machines on the network some day, you would find yourself buying an additional peer-to-peer network package such as POWERlan—an excellent combination, but it certainly entails more fuss than created by Artisoft's all-in-one solution.

All seven reviewed products could use some improvements in terms of network interoperability: Windows for Workgroups clearly holds a potential connectivity advantage with LAN Manager and later Microsoft Windows NT, but the NetWare market is still up for grabs. All seven packages could better ensure that both servers and clients are more aware of which resources and applications are being shared, and no product offers built-in modem-sharing capabilities. But there is no question that this is a fully developed product category, and users interested in connecting PCs should consider now the right time to buy.

tween 5K, and in its worst-case scenario, about 70K. 10NET can, when used under ideal conditions, get down to something under 1K.

All of the vendors whose products we review provide network setup programs written for Windows. All of the products except Windows for Workgroups use connection buttons under Windows.

With these buttons, you typically click on an available network resource such as a shared drive or printer, select a local resource designation such as a drive letter or LPT port, and click on the connection button. Windows for Workgroups tightly integrates the networking capabilities into various menus such as the Windows File Manager and Print Manager. With Windows for Workgroups, you don't need to know which resources are attached to your PC and which are on the network.

Dynamic Data Exchange (DDE), which comes with Windows, offers a powerful means of sharing information between applications. Windows for Workgroups extends this functionality across the network with the most sophisticated version of Net-DDE among our tested

products. With this capability, you can create a link between data objects that you can cut, copy, and paste inside Windows applications, no matter where those applications exist on the network. When one person in a workgroup changes or completes a linked object, it changes simultaneously in the other applications on other networked PCs. LANtastic and WEB for Windows and DOS have less sophisticated versions of Net-DDE that can't handle all of the data types in Windows for Workgroups.

DECISION FACTORS

The peer-to-peer LANs in our roundup are a powerful and appealing collection of products. As part of selecting a peer-to-peer LAN, examine the following reviews and the features table, and also weigh such important factors as the degree of Windows integration, compatibility with your existing network, compatibility with PC hardware, and support.

Next, you might want to consider such interesting features as the quality of the electronic mail that all of the products except NetWare Lite include.

Peer-to-peer networks are mature, powerful, and reliable. They should be the first choice for a networking architecture in many organizations.

Invisible Software Inc.

InvisibleLAN

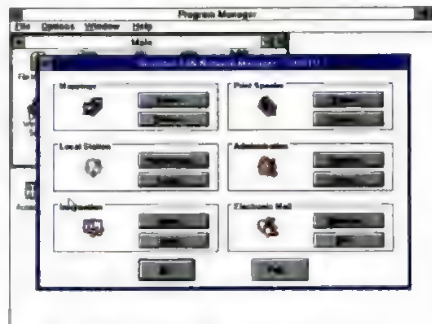
BY STEVEN C.M. CHEN

Version 3.3 of InvisibleLAN (formerly NET/30) is not only as simple as its name promises, it is also remarkably fast. Invisible Software's latest addition to its venerable LAN is the \$399 Ultra Server, an optional, dedicated, 32-bit multitasking file server. Ultra Server boosted InvisibleLAN's performance to the top tier on our benchmark tests.

The basic InvisibleLAN package includes both software and the necessary adapters. There is a software version that

is adapter-independent; it works with about a dozen Ethernet and Token-Ring adapters and is available for \$149 per node (\$99 for five or more nodes). This version supports up to 250 nodes but requires separate disks for each. The Ultra Server option is available for an additional \$399 and is licensed on a per-network basis.

InvisibleLAN was one of the first peer-to-peer LANs to include a Microsoft Windows-style interface, Network Manager. It separates management concerns into six areas. The task of assigning resources



InvisibleLAN's Network Manager breaks administration tasks into six sections.

is not as straightforward as with other products; you can either enter the information manually or browse through several windows to make your selections.

Installation is easy, and you can select either the easy or advanced configuration. For greater flexibility, InvisibleLAN also gives you the option of having multiple configuration files, and lets you load them from the command line. This provides important flexibility for optimizing the LAN according to the different types of jobs in

FACT FILE

InvisibleLAN, Version 3.3

Invisible Software Inc., 1215 N. Highway 427, #135, Longwood, FL 32750; (800) 982-2962, 407-260-5200; fax, 407-260-1841

List price: Single-user version, \$299. Ultra Server, \$399. Software: Single-user version, \$149, five or more users, \$99 per user.

Requirements: 65K RAM (server), 45K RAM (client), or 100K RAM (peer); 1MB hard disk

space; Eagle NE2000-compliant network card, Microsoft Windows 3.x

In short: InvisibleLAN has a truly impressive speed in addition to interesting e-mail capabilities, including a BBS-style public-message option. Unfortunately, its server setup and management capabilities are poorly organized.

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What the Numbers Mean

With peer-to-peer LANs, dedicated file servers make a big difference. All the tested products performed much the same when configured without a dedicated PC. But when we dedicated a PC as a file server, Invisible Software's InvisibleLAN used its Ultra Server disk cache and efficient transport software to outstrip the competition.

Peer-to-peer LANs can be configured with a dedicated server, where one PC acts as the server and the others as clients. They can also be configured with nondedicated servers, meaning that each PC on the network acts as both client and server.

When reading and writing 1K blocks on the Dedicated Server test, the Ultra Server cache on Invisible Software's InvisibleLAN was by far the most effective disk cache. Ultra Server is a 32-bit extension to DOS's file-handling structure. Once the initial location of a file is found in memory or on-disk through DOS, InvisibleLAN uses Ultra Server to access the disk or memory directly in 32-bit mode, not 16-bit mode.

InvisibleLAN with Ultra Server also outperformed the competition when reading and writing 4K blocks on the Dedicated Server test. In fact, it more than doubled the throughput it achieved without Ultra Server, and doubled the throughput of its nearest

competitor, WEB for Windows and DOS, as well. InvisibleLAN's network protocol, TransBIOS, and an excellent *lazy-write caching* program are the keys. With lazy-write caching, the operating system or the network manager bunches writes so that the program writes to disk less frequently. The longer the time between writes to the drive, the less overhead the drive's mechanical operation causes.

Invisible Software's network protocol, TransBIOS, is similar to NetBEUI (NetBIOS Extended User Interface). It negotiates a packet window—the number of packets that can be reliably transmitted between a client and server before requiring an acknowledgment from the receiving node. TransBIOS uses a more efficient algorithm for negotiating the number of packets being transmitted, however. This helped InvisibleLAN with Ultra Server reach a throughput of 1.34 megabits per second on the Dedicated

Server test when using a 1K block.

Webcorp boosted the performance of WEB for Windows and DOS with a burst-mode version of the IPX (Internet Packet Exchange) protocol. IPX normally sends a response to every request. Burst mode improves network performance by allowing IPX to issue one response for several requests. Webcorp also optimizes the server by using HyperCache, the company's proprietary technique, which puts the caching into protected mode.

Effective disk caching and well-tuned transport software made Tiara Computer Systems' 10NET, Webcorp's WEB for Windows and DOS, and Artisoft's LANtastic stand out when reading and writing 4K blocks on our Nondedicated Server test.

Tiara tunes NetBIOS by moving data directly from the network adapter hardware into the PC's cache. (Most products first copy the data into PC memory.) This implementation offered the best throughput on the Nondedicated Server test. WEB for Windows and DOS, like InvisibleLAN and 10NET, negotiates the number of packets that will be transferred before the sending client gets an acknowledgment from the receiving client. In addition, WEB uses on-the-fly data compression to reduce the amount of data it needs to send across the network.

The 1K-block version of the Nondedicated Server test stresses each

progress. With the advanced configuration, you can fine-tune just about everything, right down to setting audio alerts for certain types of errors. The Windows installation is not as automatic as it could be. You first need to run the Windows setup program from DOS, and then add the icon manually.

Once you have installed the LAN, operation is simple. As with most of the packages we saw, clients (but not servers) are warned if an active server attempts to leave the network, and the clients will automatically attempt to reconnect to

servers that do this.

Print management lets users monitor print jobs and also prioritize them. You can hold jobs or specify, for example,

which jobs are the highest and lowest priorities. You can also display print jobs by job title, time, or size. Windows Print Manager also works under InvisibleLAN,

but it will reflect only the local print-job status.

The e-mail system is broken into two sections: One has typical message capabilities, and the other is a BBS-type mail-

ing service that lets you create messages to a single user or to a group. You can print, save, and reply to e-mail directly. The BBS-type e-mail service is available only in Network Manager.

By using Ultra Server, you can configure each server as a standard peer-to-peer server or as a dedicated server. PCs using Ultra Server can take advantage of 32-bit disk accesses. Configuring an Ultra Server PC on your peer-to-peer network removes one computer from general use but also increases speed.

SLOPPY SECURITY

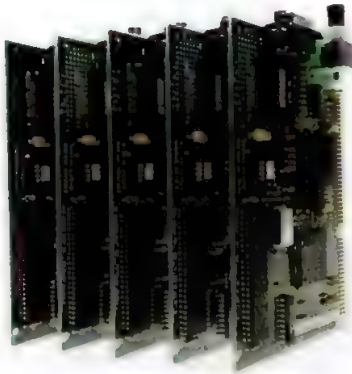
Administration is handled in two parts. You must use the DOS setup program to fine-tune a server, but Network Manager

SUITABILITY TO TASK

InvisibleLAN

	POOR	FAIR	GOOD	EXCELLENT
Communications	●	●	●	○
Resource sharing	●	●	●	○
Small-office usage	●	●	○	○

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	Microsoft Windows for Work groups	Eagle NetWare Life	Artisoft LANtastic AE-2	Buffalo/WEB Complete Network
Full Windows & DOS Support	No	No	No	Yes
NetWare Compat. (NCP Sup.)	No	No	No	Yes
Unlimited Toll Free Tech Sup.	No	No	No	Yes
Intel Auto Config. Ethernet	Yes	No	No	Yes
Money-Back Guarantee	None	None	30 day	45 day
Price (2 Node Network Kit)	\$850.00	\$615.00	\$699.00	\$495.00
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our eyes and blink and blink again."

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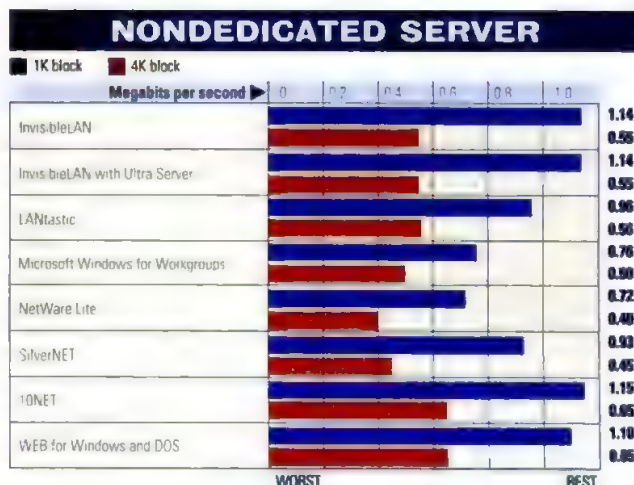
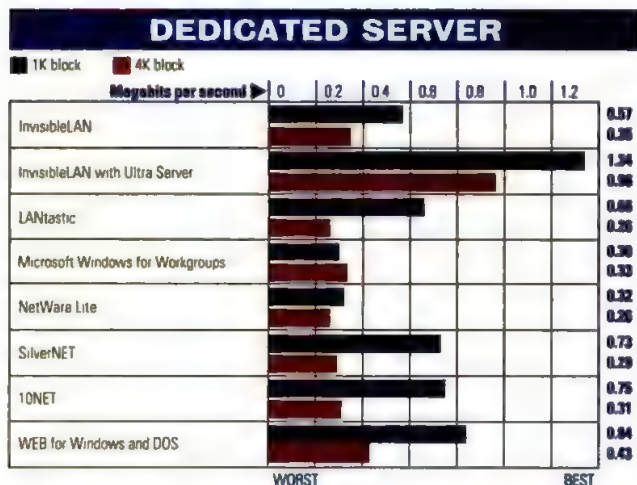
So is the Buffalo Complete Network really complete? Definitely.



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CIRCLE 328 ON READER SERVICE CARD



product's ability to transfer data between the network adapter and the local hard disk. With smaller blocks, the network operating system transfers data to the network adapter far less effectively. 10NET and InvisibleLAN were the top performers.

Because multiple clients were transmitting data at the same time, overall throughput in the configurations with nondedicated servers was not limited to the capacity of a single adapter; hence, throughput on the Nondedicated Server test was generally a bit higher than on the Dedicated Server test. On the Nondedicated Server test, the products could not rely on negotiating a larger packet window to obtain higher throughput. Instead, they used more efficient caching methods to improve their performance.

reports on connections and resources available to each user. By using the polling feature, you can manage every server on the network.

You can create users or groups of users via the password option. InvisibleLAN is an open system, however, and has no other basic security functions. It will take time and some reverse logic to close all of the open doors. You will have to exclude every user and group and specifically reassign a user or group the rights to a resource (called a shortname). You can assign six different access rights to each shortname.

Like most peer-to-peer LANs, InvisibleLAN treats each node in Windows' En-

How We Tested

Our test-bed consisted of seven Compaq Deskpro 386/25e's, each with a 386/25 MHz processor and 8MB of RAM. One of the Compaqs acted as server on our Dedicated Server test; the remaining stations were the clients on the network. For the Nondedicated Server test, all stations functioned as clients and as servers. We asked each vendor to supply its own thin-Ethernet network adapter. For vendors that did not offer Ethernet adapters, we used Eagle's NE2000 adapters.

All tests were performed at PC Magazine Labs. Our Nondedicated Server and Dedicated Server tests are variations of the I/O Throughput test from NetBench 2.05. We ran each test twice, first using a 1K-block read/write request to disk and then using a 4K-block read/write request. The change of block size stressed each product's ability to negotiate the transmission of data between client and server. We report the average throughput of all stations, in megabits per second.

hanced mode as a separate entity. Mappings that need to be applied globally must be done by using the DOS utility before you start Windows. If you're running Ultra Server, you will see an extra server on the

*With Ultra Server installed,
InvisibleLAN performed brilliantly
on the benchmark tests.*

list of possible servers. To connect to a NetWare server, you will need to use a packet driver and run the necessary shell. InvisibleLAN also offers Microsoft LAN Manager connections. The company does

The **Dedicated Server** test determines how effectively a product performs when a machine is devoted to providing file service to the clients. When the product is reading and writing 1K blocks, the test stresses its drivers and its ability to handle multiple client requests. When the product is reading and writing 4K blocks, the test stresses the disk cache and the algorithm used for negotiating packet transfers between client and server.

The **Nondedicated Server** test determines how effectively a product performs when each PC in the network is acting as both server and client. Each PC processes NetBench requests while issuing the same requests to another PC. On this test, each workstation generates a 100K file on a peer's hard disk. The file is then randomly accessed with reads and writes. The ratio between reads and writes is 3 to 1. We run the test for 10 minutes.

not yet offer Macintosh support.

Network-usage logs may include information on mapping, open files, and bulletin board access. A log can display a variable number of previous log-ons and log-offs. You can apply filters to the log for quick access to specific information. And UPS units are supported for added reliability.

ZIPPY PERFORMANCE

With Ultra Server installed, InvisibleLAN performed brilliantly on our benchmark tests. The key is a disk cache subsystem that runs in protected mode and sandwiches DOS in between caches. Whenever possible, the cache bypasses DOS for disk accesses and speeds

WHEN REMOTE ACCESS PRODUCTS WERE TESTED IN THE ARIZONA DESERT, GUESS WHO HAD THE HOTTEST SOLUTION?

The test was part of a comprehensive analysis of remote network access solutions done by *Corporate Computing*. They packed up nine dial-in server products and sent a technician out to do some real field testing—in the town of Sedona, Arizona, pop. 7940.

He dialed in to the ZD Labs LAN in Foster City, California. And when he logged off, he had a winner: Remote LAN Node® (RLN™) from DCA—a unique software solution that lets up to 16 remote users dial in at once and function just like locally connected PCs.

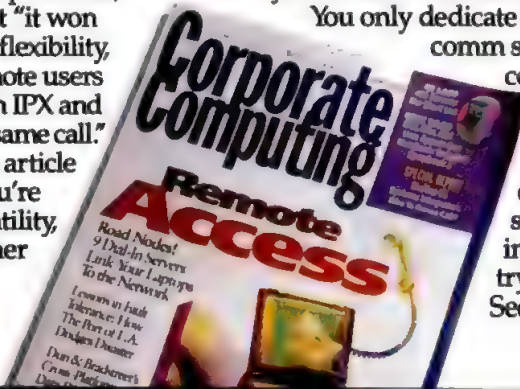


RLN PROVED IT COULD TAKE THE HEAT.

We'll let the article do the talking. "The best product was Remote LAN Node—a software solution that acts like a multiprotocol router when installed on a PC on a LAN."

The magazine went on to say, "Our winner, DCA's RLN, stood out for its capability to handle multiple communications protocols," commenting that "it won hands-down on flexibility, allowing our remote users to connect to both IPX and IP servers in the same call."

All in all, the article concluded, if you're looking for versatility, "None of the other units we tested came close."



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CIRCLE 389 ON READER SERVICE CARD

Words of Wisdom for Windows Programmers.



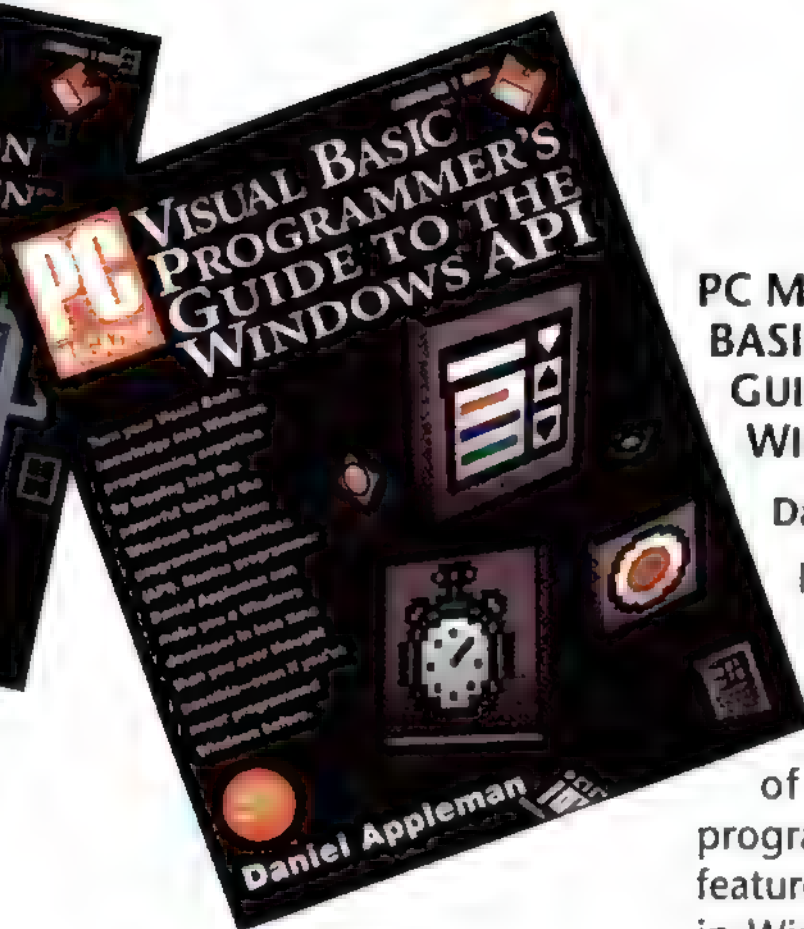
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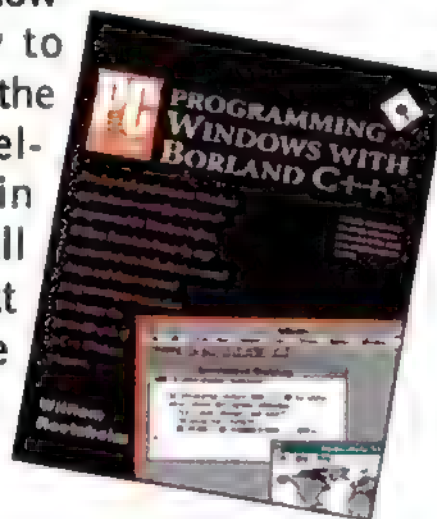
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Peer-to-Peer LANs

performance, particularly when caching CD-ROM information. When we tested it informally without Ultra Server installed, InvisibleLAN was still fast but somewhat slower. To squeeze in a bit more speed, you can put an InvisibleLAN server not running Ultra Server into dedicated mode.

If you need a high-performance network but don't want to go with a full-blown network operating system, consider InvisibleLAN. If you are currently an InvisibleLAN user and need a performance boost, the Ultra Server option is just what you've been looking for.

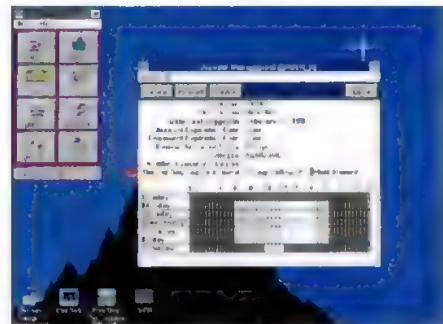
Artisoft Inc.

LANtastic

BY STEVE RIGNEY

When it comes to overall functionality, Artisoft remains king of the peer-to-peer LAN market. With version 5.0 of LANtastic, the company brings flexible security options, good management capabilities, and hooks into exciting add-on packages, making this product a must-see.

LANtastic's server program uses 53K of RAM, the client software 27K. You can load both the client and server programs into upper memory if it's available. Print-



With LANtastic, security and daily-usage allotments are controlled from one menu.

ers and CD-ROM drivers can be shared; LANtastic also supports modem-sharing products that use NetBIOS, including Artisoft's own Articom Modem Sharing Software.

With LANtastic, you can easily connect to any server on the network and launch applications across the LAN. Like most of the other packages we saw, LANtastic automatically attempts to reconnect to servers that leave the network, and as with

the other packages, you will lose unsaved information if the server from which you're drawing your application or file leaves the network. LANtastic warns the server of any client usage before log-on.

GATEWAY TO OTHER WORLDS

Artisoft provides a gateway for connecting your LANtastic network to a NetWare file server. You can access all

available NetWare files and programs through the LANtastic server. Several users can simultaneously attach to NetWare through LANtastic, but all must share the same NetWare session. This is acceptable for dedicated LANtastic servers with low traffic. You can add Macintoshes to the network via LANtastic for the Macintosh, which is a Macintosh-to-PC gateway that requires a

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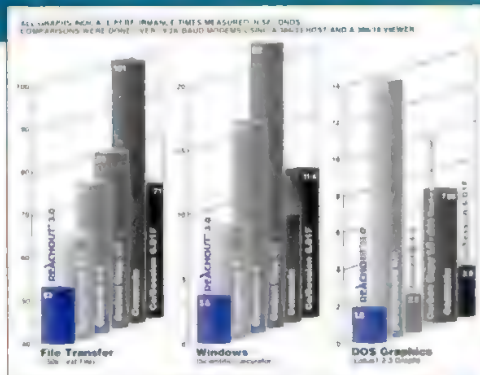
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Rated Highest by the Experts.

Info World awarded ReachOut its Highest Rating in its March 15, 1993 issue. They said "ReachOut offers superb screen mouse, and file transfer speed and provides as many security options as Sing Sing Operation is as smooth as silk - you'll think you're seated in front of the Host PC". And in August 1992, ReachOut was the PC Magazine UK Editor's Choice.



Products recommended are based on a survey of the respective users' satisfaction.

The Network Version is ideal for network administrators performing software distribution and trouble shooting and is invaluable to Help Desk personnel for providing technical support.

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August 1992
ReachOut

Troubleshooting Your Peer-to-Peer LAN

by Constantine Fotopoulos

Package	Symptom	Solution
All	The installation seems flawless, but when you reboot the machine, you can't see any other nodes on your network.	Check your cable to see that there are no loose connectors or damage to the cable. Make sure that both ends of the network are terminated with 50-ohm resistors.
All	Your cable checks out fine, but you still can't see any other nodes on your network, or the package warns you that no network card has been installed.	Check the settings on your network card and make sure they agree with the settings you used during installation. Write down all network settings (such as memory addresses) so you can enter the the correct settings when prompted for them.
InvisibleLAN	The Invisible Windows utility won't load, and the package warns you that the network drivers have not been loaded.	Go into the Windows setup and specify OTHER as the network type. Windows will then prompt you to insert a disk containing the setup information. Insert the InvisibleLAN disk and specify InvisibleLAN.
Microsoft Windows for Workgroups (with POWERlan)	After installing both packages, you open Windows' File Manager/Disk menu. When you start to do a disk redirection, the POWERlan server disk does not include a comment, as the Windows for Workgroups drives do.	Proceed normally. Windows for Workgroups will not retain the name of the shared disk; the package does not allow you to redirect a local drive. This does not interfere with normal usage, however.
NetWare Lite	Either Windows will not load, or the system locks up when trying to load Windows.	Make sure you add the following lines to your SYSTEM.INI file in the 386ENH section: <pre> TimerCriticalSection=10000 ReflectDOSInt2A=TRUE UniqueDOS PSP=TRUE PSPIncrement=5 OverlappedIO=OFF </pre>
NetWare Lite	Windows loads but locks up when you try to execute an application or try to exit.	Make sure you disable SmartDrive or any other disk-caching program. NetWare Lite uses its own caching program, which may conflict with caching software from other vendors.

dedicated PC. A TCP/IP gateway is also available. Remote access is possible through an optional package, Articom.

Because LANtastic uses a proprietary version of NetBIOS, the company includes a wide collection of adapter drivers in the package. The proprietary NetBIOS supports Artisoft's own AE-2 and AE-3 adapter cards, and a special version of LANtastic is available for use solely with those cards.

LANtastic's e-mail program provides automatic notification and a capable Windows text editor with cut-and-paste and drag-and-drop functions. You can't share mail folders, however, and you can include only one attachment with each message. It's a fairly basic utility in comparison with the version of Microsoft Mail (which is included with Microsoft Windows for Workgroups) or Da Vinci eMail (which comes bundled with

10NET); a large organization with strong e-mail needs will quickly outgrow it. Fortunately, LANtastic also supports third-party packages such as the DOS and Windows versions of cc:Mail and Futurus Team DOS/Windows Combo.

KEEPING A SCRAPBOOK

A feature called the Windows Network Scrapbook lets you share text, graphics, and sound files with other users or groups. You can use LANtastic to send messages that include a DDE macro that will launch a certain application when the recipient views the message. The Network Scrapbook features a scaled-down version of the true Network DDE support

in Windows for Workgroups. For example, you can cut and paste information into a shared clipbook, but once the information is pasted into another application, real-time changes are no longer made to it.

Network printers are shown as icons on the Windows desktop. You simply click on the desired LPT port icon and then on the corresponding printer icon to connect to it. The queue maintenance program lets you see what jobs are currently in the queue or printing, as well as the printer

status and the estimated time until the job is completed. You can select priority status for a certain job, or hold or delete it. Like 10NET, LANtastic uses Hyperprinting,

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PC FACT FILE

LANTastic, Version 5.0
 Artisoft Inc., 691 E. River Rd.,
 Tucson, AZ 85704; 602-690-3231;
 fax, 602-293-8065



List price: Software: Single-user version, \$119. 6-user version, \$659; 12-user version, \$1,189. 500-user version, \$2,999. Adapter-specific version also available.

Requires: 53K RAM (server), 27K RAM (client), or 53K RAM (peer); 2MB hard disk space; NDIS-compliant network adapter card. Microsoft Windows 3.0 or later.

In short: LANTastic offers features such as a routable NetBIOS, remote accounts, file-level security, and a network Microsoft Windows scrapbook. Its scores on our benchmark tests are better than average, and its support for both its own and other company's adapters is rock-solid. LANTastic is a powerful enticement for organizations of any size.



ON READER SERVICE CARD

which streams print jobs to the printer before the application program releases the entire file. This feature, not found in Windows for Workgroups or in dedicated-server LANs, speeds the printing process. The package notifies users if their preferred printer is out of paper or off-line.

An optional product, the \$99 Artisoft Sounding Board, adds a rich dimension to the capabilities of the LAN, especially in terms of communications. With it you can attach digitized sound messages to e-mail or to documents such as spreadsheets. You can even record audio messages correlating to LANTastic error messages. You can also use the Sounding Board to conduct a real-time voice chat with other users. Even with all this support for sound, however, there is no multimedia support yet available. The chat utility allows for single- and multiparty conversations (both audio and keyboard-based). Artisoft has also announced plans to market workgroup productivity software for meetings and conferences.

Installation was simple. The network operating system's installation program creates a batch file that will automatically log on and redirect you to the server's re-

sources each time you boot your computer. Administration is made easier with the ACL (access-control list) groups. These let you assign and change access rights for entire groups of users. This method is similar to the one NetWare uses. By using wildcards like LOGON TO *, you can attach and redirect to available resources and servers. The administration capabilities for sharing and managing resources and users are well-organized, and you can set user names, account restrictions, and passwords from within one program.

NET Manager facilitates your management of network users and groups. In addition to the usual user setup, you can assign each user to a group with specific access rights and passwords. You can force users to change their passwords at specified times, which is a useful protection against illegal entry, and passwords can be encrypted. You can assign rights with great specificity; these include read, write, create, modify, list, time-specific access, and duration-specific access. LANTastic offers protection for directories, subdirectories, and even individual files. It also includes a selection of administration tools, including account and resource auditing as well as UPS support.

LANTastic performed well on our benchmark tests. It is possible to tune the package to run its server operations even faster than it did during our testing, but

LANTastic is closing the functionality gap between dedicated-server networks and peer-to-peer LANs.

only at the expense of local application performance. LANTastic also includes a command called ALONE that sets up a PC for server-only operation.

With features such as the Windows Network Scrapbook and ACL groups,

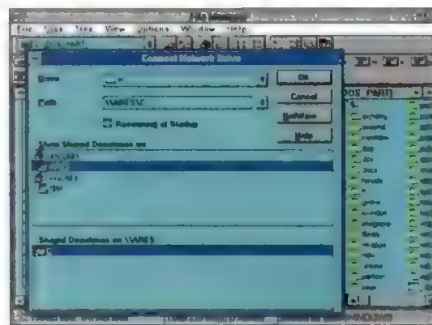
and with a wide range of options for features like sound and communications, LANTastic is swiftly closing the functionality gap between dedicated-server networks and peer-to-peer LANs. Ease of use and the excellent interface round out a powerful package.

Microsoft Corp.

Microsoft Windows for Workgroups

BY STEVE RIGNEY

Version 3.1 of Microsoft Windows for Workgroups provides the tightest integration possible between Microsoft Windows and a peer-to-peer network. With its unique scheduling features, strong



Using the Disk menu, you can connect to other Windows for Workgroups servers on the network.

e-mail package, and excellent Network DDE, this package is ideal for enhancing productivity on Windows-only networks. It is also an excellent NetWare client and holds great promise for future Microsoft Windows NT networks. And best of all you may already

own Windows for Workgroups; the software is being preloaded onto PCs shipping from vendors such as Gateway 2000, Northgate Computer Systems, Packard Bell Electronics, and ZDS.

Windows for Workgroups offers the basic functions of a good peer-to-peer LAN, such as easy file and printer sharing. But DOS PCs on a Windows for Workgroups network cannot share their files with other nodes; this inability relegates this package to the second tier of peer-to-peer LAN packages. What's more, it lacks the detailed management features found in dedicated-server LANs and the latest versions of

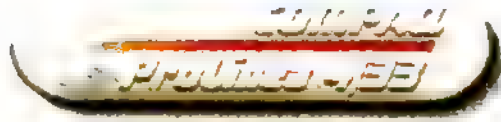
LANTastic and 10NET.

Windows for Workgroups is a full version of Microsoft Windows 3.1 with built-in peer-to-peer networking. Microsoft Corp. offers Workgroup Connection, which lets a DOS client gain access to a

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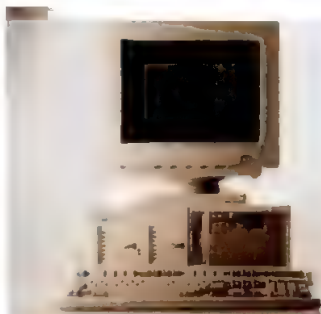
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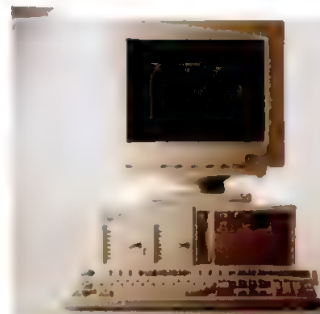
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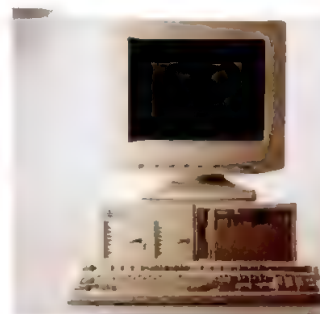
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- 64KB EXTERNAL CACHE
- 5 DRIVE BAYS • 6 ISA EXPANSION SLOTS
- WINDOWS ACCELERATED VIDEO WITH 512KB VIDEO RAM
- ULTRA VGA 1024NI MONITOR (14", 1024 x 768, .28mm, NI)
- DUAL DISKETTE DRIVES (3.5" AND 5.25")
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- ULTRA VGA 1024NI MONITOR (14", 1024 x 768, .28mm, NI)
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Survey was independently conducted by Reliability Ratings, Needham, MA. The data is quoted from a 40-page report available for purchase through Reliability Ratings (617) 444-5755.

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- WINDOWS ACCELERATED VIDEO WITH 512KB VIDEO RAM
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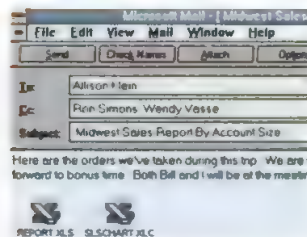
Peer-to-Peer LAN Alternatives *By Joe Salemi*

Though the peer-to-peer LANs covered in our reviews represent the state of the art, they're not the only products available for making inexpensive connections between computers. The packages below represent a variety of options: full-featured, DOS-based peer-to-peer LANs; fast, inexpensive proprietary cards and software; and simple file- and printer-sharing packages.

PRODUCT, PRICE, COMPANY	HIGHLIGHTS
NET Solution , \$199; Applied Creative Technology Inc., 214-233-8800	Peer-to-Peer proprietary LAN. Hardware only; ISA-bus cards include coprocessor, file-transfer, e-mail, and print server capabilities. Works over UTP (unshielded twisted pair) cabling. May also be used with standard peer-to-peer or NetWare networks. Cabling included. Peer-to-peer networking software, \$99.
APTN Net Affordable Wide Area Network , \$600; Automated Programming Technologies Inc., 313-540-9877	Software for peer-to-peer connections between LANs. Connects LANs via modem or works over SNA (Systems Network Architecture)-based network to link LANs to mainframe or via mainframe. Works on top of any NetBIOS or IPX network, including Microsoft LAN Manager, LANtastic, or NetWare. Price supports eight modem links; mainframe SNA-link software (\$5) supports unlimited links.
Network-OS Plus , \$190; CBIS Inc., 800-344-8426, 404-446-1332	Peer-to-peer DOS-based LAN. Supports file, printer, CD-ROM, and modem sharing. Allows users to share up to four CD-ROM drives. Software only; supports any Ethernet card or any card with ODI (Open Data-link Interface) driver. Also supports proprietary 50-Mbps link card. Can eliminate system overhead through use of UMBs (upper memory blocks); disk cache can use EMS (expanded memory specification). Includes drivers for more than 50 Ethernet cards and pocket adapters. Supports Microsoft Windows 3.x. Disk cache included. Proprietary link card, \$349.
GV LAN/OS , \$70; Grapevine LAN Products Inc., 206-865-9773	High-performance, peer-to-peer DOS-based LAN. Supports printer and file sharing and store-and-forward e-mail. Software only; supports any Ethernet or ARCnet card with ODI driver or on serial cable (up to three nodes). Uses 63K of RAM. Can be loaded into UMBs with DOS 5.0. Includes software for bridging LANs of differing topologies.
LANstep , \$99; Hayes Microcomputer Products Inc., 404-840-9200	Peer-to-peer networking system; servers can be dedicated or nondedicated. Supports optional proprietary networking system. Supports file and printer sharing and store-and-forward e-mail. Scalable. Software only; supports any Ethernet card and any card compatible with NDIS (Network Driver Interface Specification). Can connect to NetWare- or TCP/IP-based LANs. Mail gateways (to other LANstep LANs or to LANs with MHS gateways), \$395. Macintosh connection software, \$495.
ChosenLAN , \$399; Moses Computers Inc., 408-358-1550	Proprietary 4-Mbps LAN. Supports file and printer sharing. Four-port and one-port card with LAN software. Simple installation. Low overhead; requires 26K per workstation without EMS or UMB usage. Maximum of 53 nodes; external central hub available to expand LAN to 255 users (\$50 per port).
MosesALLI , \$99; Moses Computers Inc., 408-358-1550	Proprietary, two-port, 2-Mbps hardware cabling package. Supports file and printer sharing. Simple installation and setup. Uses standard telephone cable with RJ-11 connectors. Low overhead; 26K required per station without EMS or UMB usage. Allows eight users maximum.
MosesUPI , \$199; Moses Computers Inc., 408-358-1550	Proprietary eight-port adapter card and speedup software. Supports file and printer sharing. Single workstation acts as hub for seven additional PCs. Maximum of 53 nodes; external central hub available to expand LAN to 255 nodes (\$50 per port).
MosesWINI , \$199; Moses Computers Inc., 408-358-1550	Proprietary two-port 4-Mbps card and LAN software for Windows. Supports file and printer sharing. Comes with Microsoft Windows programs for browsing and network management, and Windows for Workgroups driver.
PromiseLAN Fast , \$299; Moses Computers Inc., 408-358-1550	Proprietary 4-Mbps LAN. Supports file and printer sharing. Two dual-connector cards with LAN software. Simple installation. Low overhead; requires 26K per workstation without UMB or EMS usage. Maximum of 53 nodes, external central hub available to expand LAN to 255 users (\$50 per port).
LANLink Professional Extended , \$199; The Software Link Inc., 404-448-5465	DOS-based, peer-to-peer LAN software. Supports file and printer sharing. Software only; supports servers running RS-485 board and software; compatible with NE1000, NE2000, and Western Digital Ethernet cards. Can also link via parallel or serial cables. Uses NetBIOS. Can have any combination of supported hardware links in the same network; not limited to Ethernet. PC-MOS (Multiuser Operating System) connections allow 32 users maximum. Client requires 4K; nondedicated server requires 30K.
LANLink Professional Standard , \$99; The Software Link Inc., 404-448-5465	DOS-based, peer-to-peer LAN software. Supports file and printer sharing. Software only; compatible with NE1000, NE2000, and Western Digital Ethernet cards. Also supports parallel-port and serial-port links. Uses NetBIOS. Allows any combination of supported hardware links in the same network; not limited to Ethernet links.
NET-127 PC Network , \$99; Trans-M Corp., 800-533-0738, 508-359-5144	Basic file- and printer-sharing package. Uses standard telephone cable with RJ-11 connectors. Offers basic e-mail capabilities. Daisy chain configuration. Allows 255 users maximum.



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Windows for Workgroups server, but the network does not let those clients share their files—a fatal flaw for networks using both DOS and Windows. To provide DOS connectivity, you can merge Windows for Workgroups networks with servers and clients running POWERlan, SilverNET, and 10NET, or any other network operating system using SMB over NetBEUI. (For more information on POWERlan, see the sidebar “Team Player.”) Through Microsoft LAN Manager, Windows for Workgroups can connect to Macintoshes, as well as PCs running OS/2. Since Windows for Workgroups runs over NDIS, it works with a wide variety of adapters, including Token-Ring adapters.

The other operating systems in this review run the network as an application under Windows. Microsoft integrated networking into the menus and functions

Team Player

by Steve Rigney

For the past two years, POWERlan, Performance Technology's network operating system, has shared the Editors' Choice spotlight with Artisoft's LANtastic. POWERlan was not eligible for inclusion in our peer-to-peer LAN review this year, however, because we chose to focus on LANs with graphical user interfaces (GUIs). POWERlan has a strictly DOS interface. This year POWERlan has found a new niche for itself as the perfect adjunct to another package in our roundup—Microsoft Windows for Workgroups.

Because POWERlan can run on top of the NetBEUI (NetBIOS Extended User Interface) protocol stack, you can use the NetBEUI DOS driver that comes with Windows for Workgroups to create a connection between a PC running Windows for Workgroups and a PC running POWERlan. POWERlan's capabilities for Windows and the DOS capabilities of Windows for Workgroups are both incomplete, but combine the two and you have a powerful network operating system with almost all the capabilities of the large file-server network operating systems—a nearly irresistible combination.

CHEAP AND EASY

And combining the two packages, although more expensive than simply

buying LANtastic, is remarkably inexpensive. POWERlan is priced at \$99 per node and includes peer-to-peer as well as dedicated-server capabilities. The dedicated-server software is included in the two-user starter package. Larger dedicated-server and peer-to-peer packages are available from Performance Technology. Licensing is protected by the serial-number comparison scheme used in most peer-to-peer LAN packages.

The simple POWERlan installation program offers context-sensitive help. And POWERlan provides unique features not found in other peer-to-peer packages, such as a pop-up redirector, remote booting, and remote control through another personal computer on the network—or even over the phone. Such standard features as user groups, security capabilities, and file, printer, and CD-ROM sharing are available as well.

The name of the POWERlan server running the DOS NetBEUI driver will appear among the available servers listed in the Disk menu in the Windows for Workgroups File Manager. The disk drives may not appear, however, and you will probably need to supply Windows for Workgroups with POWERlan drive information to connect to the POWERlan server. Microsoft's Workgroup Connection DOS software may

available to the network, Print Manager will automatically start when you launch Windows, and it must remain running in order for others to share your printer. The Print Manager shows only basic status information, such as the size and date of pending and active print jobs. It does not alert you or other users to paper jams or outages, and it lacks the Hyperprinting feature found in LANtastic and 10NET.

Password protection is limited. File owners may grant full access, read-only access, or no access to other users. Protection is limited to resources, directories, and subdirectories. Many other products in this

review offer more sophisticated control over rights, and some allow you to set rights for groups of users as well as for individuals. As with other packages, Windows for Workgroup clients will automatically attempt to reconnect to absent servers. The program doesn't allow for disk-threshold alerts, as 10NET does.

Windows for Workgroups includes a special, scaled-down edition of Microsoft Mail for PC Networks, Version 3.0. This version lacks management features necessary for larger LANs, but it is more solid than LANtastic and offers more room for growth. Windows for Work-

FACT FILE

Microsoft Windows for Workgroups, Version 3.1

Microsoft Corp., One Microsoft Way,
Redmond, WA 98052-6399; 800-426-9400,
206-882-8080; fax, 206-936-7329



List price: Two-user version, \$549.95. Single-user upgrade from Microsoft Windows 3.1, \$99.95. **Software:** Single-user version, \$99.95. Upgrades for DOS and Microsoft Windows 3.1 PCs also available.

Requires: 3MB RAM, plus 14K RAM for card driver (client, peer, or server); 15MB hard disk space; NDIS-compliant network card; Microsoft Windows 3.1 or later.

In short: Microsoft Windows for Workgroups provides capable, masterfully integrated peer-to-peer networking. Features such as Microsoft Mail and Schedule+ help make this peer-to-peer LAN both useful and powerful.



of Windows itself. Network administration and management utilities are spread out among Windows' Clipbook Viewer, Control Panel, File Manager, and Print Manager. Network printing is managed through the improved Print Manager. You click on resources that you want to use or share. If you make your printer

also be used to connect to a POWERlan server.

NOW SERVING DOS

A remarkable program called DOSserve, which is part of POWERlan and should be shipping by the time you read this, makes the connection between Performance Technology and Microsoft even more powerful. DOSserve is a 13K TSR program that allows you to use your DOS-based PC to share up to 10 disk drives or a CD-ROM with your Windows for Workgroups network. DOSserve allows DOS machines to act not only as clients but as servers on a Windows for Workgroups network—this represents a significant improvement in Windows for Workgroups' functionality.

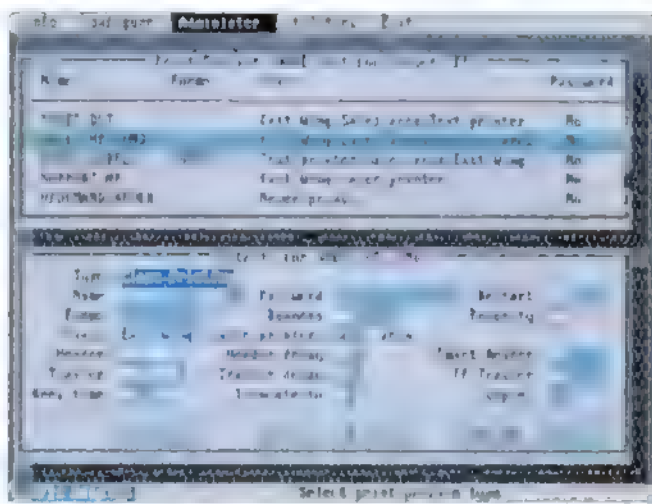
One of the most useful utilities in the POWERlan package is its remote-access capability. Each PC in the network can, as needed, be designated as a remote-access workstation.

With this utility, any user with the proper security rights and passwords can control any remote-access PC across the network. The utility, which resembles node-to-node remote-control packages such as pcAnywhere from Norton-Lambert Corp., is ideal for managing file

servers, checking a colleague's PC for a missing memo, or simultaneously working on personal computers located in separate areas.

Modem-to-LAN remote control is also possible through WARP, a product developed by Performance Technology and available for \$99 per node. WARP allows you to dial into a PC on your POWERlan network from any remote PC and log on as a remote user. You can

then use this remote access to control any available PC on the network. The combination of POWERlan and WARP enables you to manage and control every PC on your network from any location.



POWERlan's printer classes let the network pass jobs to printers that meet certain qualifications.

PRINTERS WITH CLASS

Network printing is another area that POWERlan addresses in an unusual but effective fashion. Through the PLADMIN utility, POWERlan allows you to set up "classes" of similar printers. These printers might share such parameters as escape sequences and header and footer information.

With this setup, you can then choose to print to a particular printer or to a class of printer. If you choose to print to a class, your print job can be serviced by any printer that meets the requirements described in the class configura-

groups has a better e-mail program than the one delivered with LANtastic, and it also has more room for growth. Windows for Workgroups also includes Schedule+, a powerful workgroup scheduler for individual and group events. Schedule+ ties into the mail database and uses the information to check and set appointments for the workgroup. Windows for Workgroups includes a basic chat utility. It does not support multiparty chats, as LANtastic's utility does.

Both of these applications employ the simple version of the Microsoft Simple Messaging Application Program Inter-

face (Simple MAPI). Simple MAPI lets vendors easily incorporate messaging into their applications. By offering Simple MAPI support, Windows for Workgroups becomes a platform for building sophisticated networked applications.

Aside from messaging, Microsoft for Workgroups also allows you to share network information by using DDE, which lets workgroup members share objects in Windows applications and work together to finish a project. For example, you can embed text from a Microsoft Word for Windows file open on one PC into a Microsoft Excel spreadsheet open on an-

other PC. As you make changes to the text in Word for Windows, Windows for Workgroups updates the text in real time in Excel. Only LANtastic rivals the Network DDE in Windows for Workgroups.

POWERlan's only major shortcoming is the absence of reliable file-level security. Rights can be assigned only to directories and subdirectories. If you need more security for your data, you'll need to choose a third-party product or rely on DOS commands to hide files or mark them as read-only. We found no conflicts between POWERlan's security and that of Windows for Workgroups, however.

POWERlan boasts excellent support for a variety of ARCnet, Ethernet, and Token-Ring adapters. POWERlan does not ship with network adapters but includes drivers for approximately 30 different cards.

POWERlan is without question an important peer-to-peer network operating system, even without a GUI interface. The addition of extra utilities such as remote access and class printing give POWERlan a unique edge over a lot of other peer-to-peer products. The combination of POWERlan with Windows for Workgroups may well be a knockout punch. □

► FACT FILE

POWERlan, Version 2.30

Performance Technology Inc., #800 Lincoln Center, 7800 I.H. 10 West, San Antonio, TX 78230; 800-327-8526, 210-349-2000; fax, 210-366-0123

List price: Two-user version, \$198 (software only).

Circle 505 on reader service card

SMOOTH INSTALLATION

Installation is nearly identical to that of Microsoft Windows 3.1, though users must occasionally choose a network adapter. The installation program examines your PC for a network adapter, and in many cases it configures itself and never prompts the user for network adapter settings. You can select your net-

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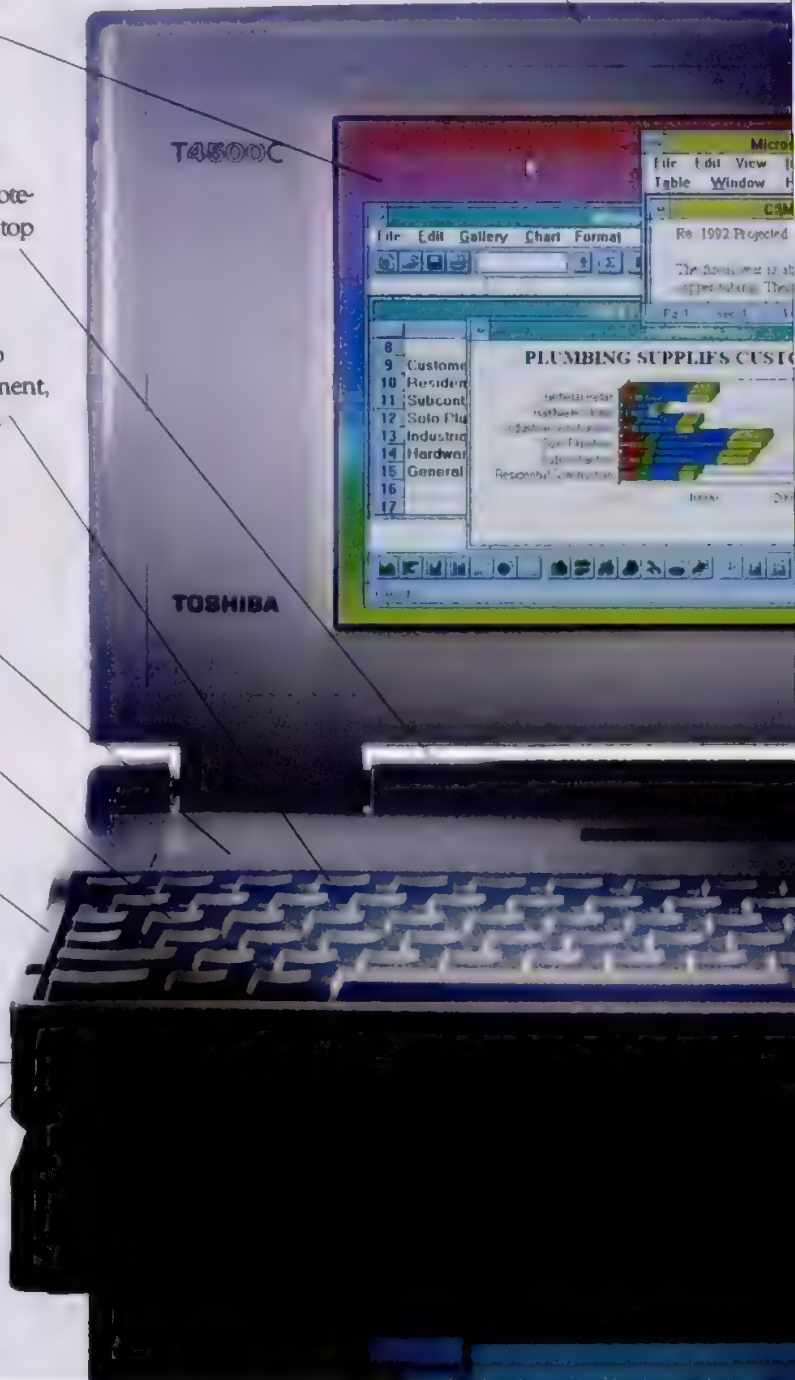
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■ Personal NetWare: *Integrating the Novell Product Line*

by David Greenfield

With Personal NetWare, Novell will introduce a powerful package to the peer-to-peer LAN market. Most impressive about Novell's latest product will be its integration of the company's various network operating systems.

The new product, which Novell will officially announce later this summer, will offer a wide range of enhanced functions. Distributed and synchronized accounts, much-touted features in Version 4.0, will find their way into Personal NetWare. Distributed and synchronized accounts require only one login, not one login per file server.

Personal NetWare will also offer better support for laptops and other portables. You will be able to designate certain resources (files, for instance) as mobile objects. These are then copied to your machine. When you plug the machine back into the network, a suite of utilities synchronizes the two versions of the file.

Network management will also be enhanced. The Simple Network Management Protocol (SNMP), which gathers information from different vendors' devices, will be used to let Novell's Network Management Station (NMS) gather information from Personal NetWare stations.

POTENTIAL IMPACT GREAT

Perhaps the greatest innovation in Personal NetWare has less to do with its actual features set and more to do with its potential impact on the peer-to-peer LAN market. While peer-to-peer LAN vendors have made impressive strides in enhancing the performance of their products, most of these products still lack the tools for operating smoothly and efficiently in the enterprise network.

Security and network management tend to be limited in these peer-to-peer packages, and none provide the multitasking, multiprocessing operating systems needed to run enterprise-wide networks. (Support for Windows/NT and OS/2 may change that, however.) Most users find that migrating a small workgroup to a large network can be difficult at best.

The bundle of Personal NetWare and the rest of the NetWare product line promise to fill this niche admirably. By providing a single front-end, Novell will be able to offer a path that extends from small workgroup networks to enterprise-wide LANs. You will be able to migrate from NetWare Lite to the 2.x, 3.x, and 4.0 file-server versions of NetWare. At present, this process necessitates changes to the client. □

work adapter from a list of nearly 100; you may also need to select settings for interrupts, I/O, and memory. During installation, it's crucial that you know and use the proper workgroup name, since you will be able to communicate only with other users that have the same name.

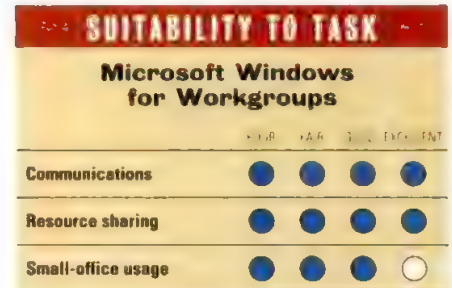
Since Windows for Workgroups operates transparently to the end user, it has relatively few network administration utilities. Administrators can view shared drives and printers, and manage users and groups for the e-mail and scheduling programs. A user can move a sliding bar that allocates his or her computer's CPU

time between sharing network resources and running local applications. Windows for Workgroups lacks auditing abilities, as well as the ability to set access rights, time restrictions, forced password changes, and other administrative matters. Worst of all, the package lacks support for a UPS interface.

Windows for Workgroups also provides a version of IPX, which allows the user to connect to NetWare file servers without leaving Windows. You use the control-panel window to choose your connections. Windows for Workgroups lets you simultaneously act as a NetWare,

LAN Manager, and Windows for Workgroups client; this was not previously possible under Windows.

Windows for Workgroups performed well on our benchmark tests. We found it difficult to test the product, since the system has an adaptive NetBEUI that can change the packet size and operate



without confirmation during some types of file actions. Users will find that performance depends greatly on the amount of memory in the PC acting as a file server. We recommend using at least 8MB of memory in the server.

Windows for Workgroups is ideal for small groups of people who run Windows and need to share resources. Its e-mail and scheduling capabilities are excellent, and it is easy to use if you are familiar with Windows. If you don't run Windows, however, or if you have serious security needs for your LAN, Windows for Workgroups is not the product for you.

Novell Inc.

NetWare Lite

BY STEVEN C.M. CHEN

NetWare Lite, Version 1.1, isn't a stellar performer, but it offers a friendly new Microsoft Windows interface and some interesting NetWare 4.0 user-management feature. Novell has added more capabilities to its low-end package, but NetWare Lite still lacks many of the bells and whistles its peers have.

This \$99-per-node package will work with any network card that has ODI drivers. NetWare Lite also comes bundled with cards and additional software from third-party manufacturers such as Eagle Technology or Xircom.

You can administer no more than 25 NetWare Lite nodes at once, but you can install up to 255 nodes on one NetWare Lite network. NetWare Lite integrates

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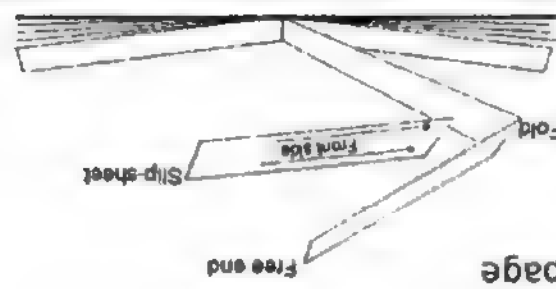
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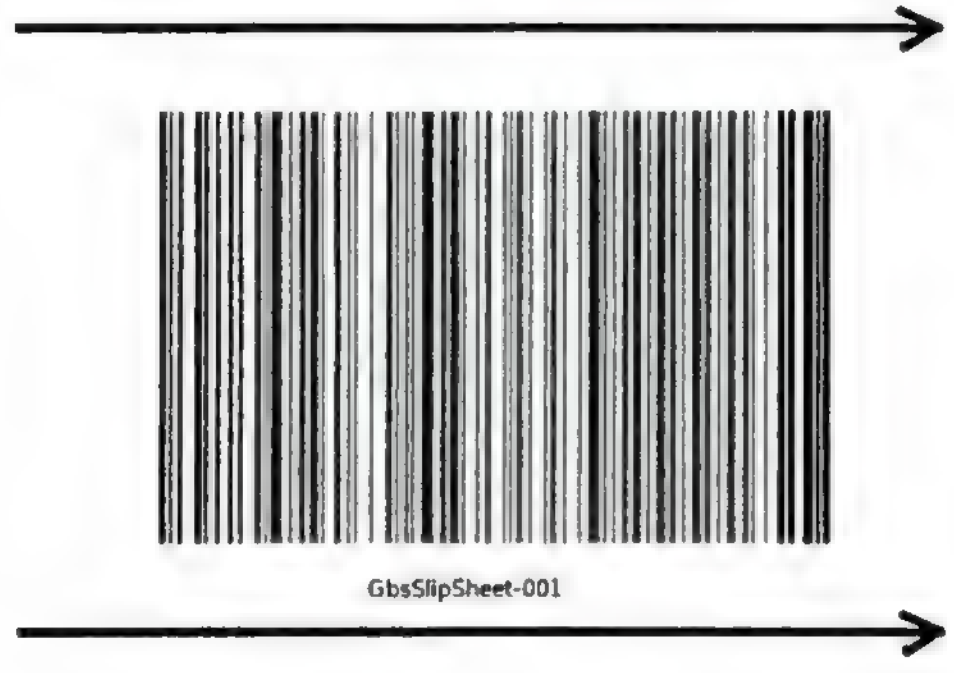
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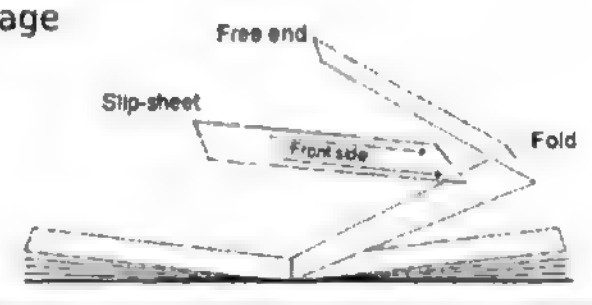
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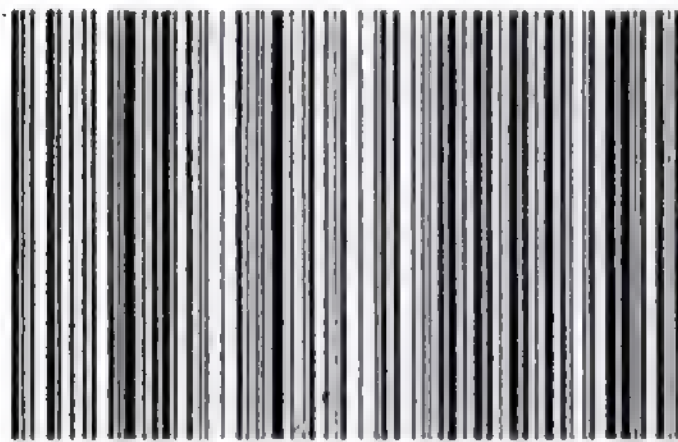
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Gbs5lipBack-0018

Back

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Ornetix Technologies Inc.

by Padraic Boyle

What if you already have a Novell network but would like to offer peer-to-peer capabilities too? Consider Ornetix Technologies' SerView, a 40K TSR program that lets a workstation act as an additional NetWare server on an existing Novell network by running the NetWare Services suite. At \$295 for a single-server, 94-user license, SerView can ease network-overload woes while saving you most of the cost of adding another copy of NetWare and another NetWare server to your network.

NOT JUST ANOTHER SERVER

Unlike NetWare Lite, SerView works with Novell's NCP (NetWare Core Protocols) and IPX (Internet Packet Exchange) and requires at least a 286-based PC. To the Novell network, the machine running SerView appears as just another NetWare server. You can use most of the NetWare commands on the SerView server, including Map, Syscon, and Volinfo, and you can create users, groups, and login scripts. Other DOS devices such as CD-ROM and WORM (write once, read many) drives can also be shared as server resources. Up to 16 different DOS directories or devices may be shared as volumes with names you choose, although, like NetWare, SerView requires one volume be labeled SYS:.

Since SerView is DOS-based, only read, write, and read/write restrictions can be placed on directories. Users with supervisory status are automatically granted read/write access. It also shares

Novell's login and password capabilities. The installation process is simple, even simpler if you're knowledgeable about Novell and peer-to-peer networks. Like a NetWare, Version 2.2, server, SerView can run in dedicated or nondedicated mode.

Like NetWare, SerView creates Login, Mail, Public, and System directories, but unlike NetWare, it creates none of the accompanying files. You will need to map a drive to the new SerView server and copy the NetWare server's public files after installation. You must also generate an IPX driver for the adapter installed in the workstation if the driver is not already present. Afterwards, you'll need to execute SHARE.EXE and then SerView's SERVU.EXE.

SerView can be loaded into available high memory and may be unloaded by typing SERVU/U at the prompt. A dedicated server can be taken down by hitting the Esc key and unloading the program from memory; we found, however, that the program did not seem to unload entirely. You should reboot to reset the server.

SerView acts mainly as relief to your NetWare server by load balancing; that is, if e-mail traffic is causing undue stress to your server, SerView will relieve the strain cheaply and transparently. SerView also offers interesting configuration options for managers concerned with network security. For example, it lets you offer access to network-based files to someone outside your company. One worksta-

tion on the Novell network can be configured with SerView, a modem, and a remote dial-in program such as Triton Technologies' CO/Session. By offering Novell users SerView-based access to the workstation's hard disk and allowing outside dial-in access, the administrator can permit both in-house and outside access to the same files without opening a potentially dangerous route into the Novell network itself.

We tested SerView on a testbed of one Novell, Version 3.11, server and four Compaq 386 workstations. Each node used an NE2000 Ethernet adapter. One workstation had SerView installed. The other three logged into the Novell server and mapped a drive into the SerView server. In the first test, the SerView PC was configured as a nondedicated server. In the second, it was configured as a dedicated server. In both, the SerView server ran SmartDrive; other disk-caching products may also be used with SerView.

Ornetix's technology is currently licensed by XTree Co.'s Tools for Windows. Expect other companies to offer this product's technology soon. □

► FACT FILE

SerView, Version 1.01

Ornetix Technologies Inc., Department SW1, 55 Reid St., South River, NJ 08882; 800-347-8439, 212-764-2385; fax, 212-768-2301

List price: Single-server license, \$295; 10-server license, \$995. Each server supports 94 users.

Requires: 286-based PC or better.

Circle 506 on reader service card

easily with existing NetWare servers. It also includes a feature called "replicated user accounts over multiple servers," which appears in NetWare 4.0. This allows users with accounts on more than one NetWare server to log onto the network, rather than onto each server individually. A Windows-based utility, auto reconnect, remote management, and CD-ROM and printer sharing are stan-

dard, as they are in other products we saw. The disk cache is optimized only for DOS. E-mail and certain management facilities are missing.

A client PC requires about 13K of RAM (including the amount of RAM the ODI drivers and client software need). The server software requires an additional 34K of RAM, and its size will vary depending on the server's settings. The

drivers and software work with DOS's LOADHIGH command and can be unloaded from memory. Since Novell didn't provide any cards, we used the Eagle NE2000 for testing.

NEW WINDOWS INTERFACE

The biggest face-lift for NetWare Lite is WNET, the attractive Windows-based management utility, which duplicates ev-

NETWORKING

Peer-to-Peer LANs

► SUMMARY OF FEATURES

CONTINUES

Products listed in alphabetical order

■ = YES □ = NO

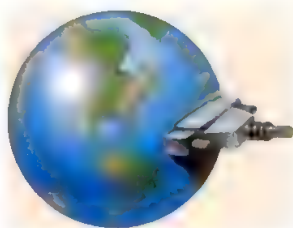


	InvisibleLAN	LANtastic	Microsoft Windows for Workgroups	NetWare Lite	SilverNET	10NET	WEB for Windows and DOS
Version number	3.3	5.0	3.1	1.1	2.0M	5.1	4.0
List price (tested configuration)	\$2,093.00 (does not include Ultra Server)	\$2,154.00	\$599.85	\$693.00	\$2,093.00	\$1,794.00	\$765.00
Maximum number of users served by tested configuration	250	7	7	7	7	7	10
List price per tested node	\$299.00	\$307.71	\$85.69	\$99.00	\$299.00	\$257.29	\$76.50
Hardware included	■	■	□	□	■	■	□
Company sells hardware separately	■	■	□	□	□	■	□
List price	\$299.00	\$279.00	N/A	N/A	N/A	\$249.00	N/A
Software available separately	■	■	■	■	■	■	■
Distribution Channels							
Dealers	■	■	■	■	■	■	□
Mail order	□	■	■	■	□	■	□
VAR	■	■	■	■	■	■	■
Direct	□	■	■	■	■	□	□
Network Adapter							
Drivers included with adapters:							
NDIS	□	■	■	□	□	■	□
ODI	□	■	□	■	□	■	■
Eagle NE2000-compatible	■	□	■	■	■	■	■
Western Digital WD8003	□	□	■	□	■	■	□
Other drivers available from company	■	□	□	□	□	■	■
List price	\$10 per disk	N/A	N/A	N/A	N/A	Free	Free
Network compatibility	Ethernet, Token-Ring	ARCnet, Ethernet, Token-Ring	ARCnet, Ethernet, Token-Ring	ARCnet, Ethernet, Token-Ring	ARCnet, Ethernet	ARCnet, Ethernet, Token-Ring	ARCnet, Ethernet, Token-Ring
Configuration can be changed after installation	■	■	■	■	■	■	■
Memory							
RAM used in tested configuration:							
DOS/Microsoft Windows server	65K	53K	14K (Windows server only)	34K	41K	41K	300K
DOS/Microsoft Windows client	45K	27K	14K (Windows client only)	13K	18K	28K	30K
Peer	100K	53K	14K	47K	41K	57K	40K
Can be loaded in expanded memory	■	□	□	■	□	□	□
Can be loaded in extended memory	■	□	■	■	□	□	□
Can be loaded in upper memory	■	■	□	■	■	■	■
Can be unloaded without rebooting	□	■	■	■	■	■	■
.SYS drivers in CONFIG.SYS	■	□	■	□	□	■	□
Built-in memory manager	■	□	■	□	□	■	□
Supports third-party memory manager	■	■	■	■	■	■	■
Can be unloaded without rebooting	□	■	□	■	■	■	■
Adapter drivers loadable in workstation	The Clarkson Packet Driver Collection	NDIS-compliant	NDIS-compliant	ODI-compliant	None	NDIS-compliant	The Clarkson Packet Driver Collection
Program Features							
Boot ROM available	■	■	□	□	□	□	□
Disk cache included with software	Invisible Cache	LANcache	SmartDrive	NLCache	SilverCache	10Cache	HyperDisk
Displays print queue at workstation	■	■	■	■	■	■	■

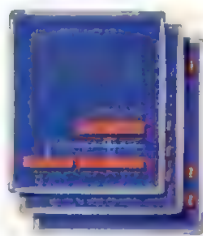
N/A—Not applicable The product does not have this feature

Smartcom For Windows.

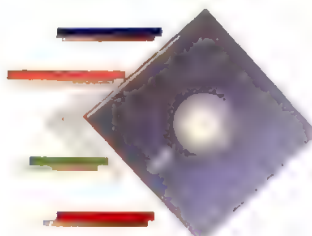
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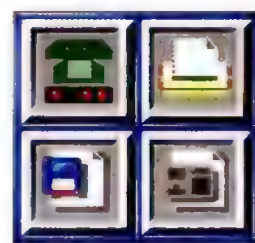
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NETWORKING

Peer-to-Peer LANs

► SUMMARY OF FEATURES

ENDS

PC EDITOR'S CHOICE Products listed in alphabetical order ■ = YES □ = NO							
	InvisibleLAN	LANTastic	Microsoft Windows for Workgroups	NetWare Lite	SilverNET	10NET	WEB for Windows and DOS
Program Features (continued)							
User/administrator may delete jobs from queue	■	■	■	■	■	■	■
Alerts user/administrator to empty paper trays	□	■	■	■	□	■	□
Offers customizable separator pages	■	■	■	■	■	■	□
Windows Features							
Functions available through icons	■	■	■	■	■	■	■
Network DDE	□	■	■	□	□	□	■
Drag-and-drop	□	■	■	■	□	□	■
Windows-based print utility	■	■	■	■	■	■	■
Peripherals							
Supports CD-ROM drives	■	■	■	■	■	■	■
Supports asynchronous-communications server	■	■	■	■	■	■	■
Supports tape backup drives	■	■	■	■	■	■	■
Supports UPSs	■	■	■	□	□	■	■
Network Management							
Includes SNMP agent	□	□	□	□	□	□	□
Sends alerts to NetView	□	□	□	□	□	□	□
Sends alerts to CMIP manager	□	□	□	□	□	□	□
Detects disconnected adapter	■	■	□	■	■	□	■
Warns of bad frames or packets	□	□	□	■	■	□	■
Warns of illegal entry attempts	□	■	□	□	■	■	□
Windows-based user creation and configuration	□	■	■	■	□	■	□
Windows-based security rights	■	■	■	■	■	■	■
Usage Information							
Displays error messages	■	■	■	■	■	■	■
Keeps error log	□	■	□	■	■	■	■
Tracks resource use	■	■	■	■	■	■	□
Displays active users	■	■	■	■	■	■	■
Security							
Can hide individual files	■	■	□	■	□	■	■
Can hide directories	■	■	■	■	■	■	■
Can create security groups	■	■	□	□	□	■	□
Can set account expiration date	□	■	□	■	□	■	□
Can set time restrictions	□	■	□	■	□	■	□
Can password-protect specific resources	■	□	■	■	■	■	■
Assignable file-protection rights:							
Execution-only	■	■	□	□	■	■	□
List	■	■	□	■	■	■	□
Read	■	■	■	■	■	■	■
Write	■	■	■	■	■	■	■
Create	■	■	■	■	■	■	□
Delete	■	■	■	■	■	■	■
Software Features							
Menu-driven software	■	■	■	■	■	■	■
DOS command line	■	■	■	■	■	■	■
Displays available network resources	■	■	■	■	■	■	■
E-mail package included	■	■	■	■	■	□	■
MHS-compliant	□	□	□	■	□	N/A	□
Chat	□	■	■	□	■	■	□

N/A—Not applicable. The product does not have this feature.

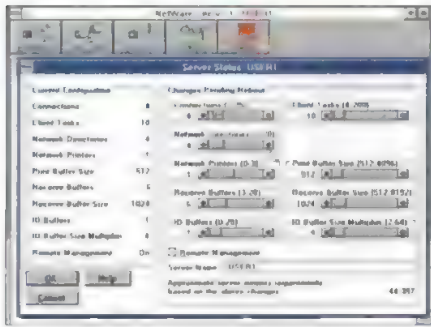
Peer-to-Peer LANs

ery function of its DOS counterpart. It has a client area for managing individual resources and a network area for managing everything else.

You assign resources, such as network directories or printers, by dragging and dropping. Each resource has its own icon, and the interface alerts you if you're attempting an illegal action.

NetWare Lite doesn't remember the assigned resources from one log-on to the next, but you can put assigned resources into a batch file and load them after a log-on. This provides a measure of flexibility for users who need access to different resources at different times. Users save the connection information to a batch file and manually load it as needed. Unfortunately, the management utility doesn't dynamically update all resource displays, only those pertaining to print-job status.

NetWare Lite, like the other reviewed packages, automatically reestablishes a connection. No warning appears to the clients when a server leaves the network, but the server is warned that resources or files are in use. Users cast adrift by an



NetWare Lite's remote management lets every server on the network be monitored remotely.

anager that monitors print jobs. Windows Print Manager is also available. Still, file size and time information aren't available, and there are no warnings when the printer jams or needs paper.

NetWare Lite hasn't acquired e-mail or chat features since the last time we reviewed it, though it does support any MHS-based e-mail package such as Da Vinci eMail or Futurus Team DOS/Windows Combo. Unlike other packages we reviewed, NetWare Lite does not need the user-list tracking that is offered by NetWare 2.x or 3.x; instead it uses the replicated-user feature. But any package that requires an SPX, such as PSERVER.NLM, will not function with NetWare Lite's limited SPX support. As with the larger versions of NetWare, you can send short messages of up to 30 characters each across the network.

NetWare Lite's installation is suitably simple, offering basic installation with nothing fancy. Since each PC requires its own disk, make sure that you clearly mark original and backup disks. The two-step installation involves installing all the DOS files and then running a separate program to install WNET; this procedure lets DOS-only users save precious RAM.

CACHE OR TARRY

If you decide to use NetWare Lite's own cache, NLCACHE, make sure no other cache is running. During our testing, Windows' SMARTDRV provided better performance. Make sure the delayed write is turned off, or a system lockup will

likely occur, as it did during our testing. Remote, which is a module, lets you manage and monitor servers remotely from any PC. It makes available extensive statistics about server operations. With supervisor privileges, you can establish new users and resources. Users cannot be grouped, and the auditing capabilities are rudimentary at best.

Password security lets you restrict access to directories and subdirectories only. Users may be prompted for a specific style of password or to change their passwords at set intervals. Passwords are stored and transmitted in encrypted form. The access rights are rather basic. You can set three types of rights: all access, read-only access, and no access. Unlike Microsoft Windows for Workgroups, NetWare Lite does not password-protect network resources, but each user may be assigned specific rights to a resource.

Access to a NetWare 2.x or 3.x server is easy, but it could be easier. Many of the commands offered in NetWare Lite are now the same as in NetWare 2.x and 3.x. But to log on, you must load IPX and NETX. (Note that WEB for Windows and DOS doesn't need you to load those shells.) For existing NetWare PCs, you must run NetWare Lite's client software; just make sure it's a unique copy. The same applies to TCP/IP, since ODI accepts multiple-protocol stacks.

In the same vein, NetWare Lite scored at or near the bottom on each of our benchmark tests. In light of the competition, this youngster from Novell still has some growing up to do. But if you're looking for easy integration into an existing or future NetWare server, NetWare Lite offers you a head start.

Net-Source Inc.
SilverNET

BY PADRAIC BOYLE

Net-Source's SilverNET, Version 2.0M, boasts good performance, interoperability with both NetWare and Microsoft LAN Manager networks, and relatively

FACT FILE

NetWare Lite, Version 1.1

Novell Inc., 122 E. 1700 South, Provo, UT
84606; 800-453-1267, 801-429-7000;
fax, 801-429-5775

List price: Software: Single-user version, \$99. Hardware-software bundles are available from third-party vendors.

Requires: 34K RAM (server), 13K RAM (client), or 47K RAM (peer); 14MB hard disk space,

network card with ODI drivers, Microsoft Windows 3.x
In short: NetWare Lite offers stability and easy connections to larger NetWare installations. Unfortunately, it is no speed demon, is not well-integrated with Windows, and doesn't support more than 25 users.

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9552 Contura 3/25 with 120 MB—25 MHz 386SL notebook weighing in at just over 6 lbs. This high powered system includes 4 MB RAM, 64K cache, 120 MB IDE hard drive, & 640 x 480 display **\$1599.**

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10891 ProLinea 4/50 with 120 MB, Windows	1699.
10894 ProLinea 4/50 with 240 MB, Windows, 5 1/4" drive, Modem, Prodigy.....	1999.
9553 LTE Lite/25c with 120 MB	3499.
9552 Contura 3/25 with 120 MB, Windows	1599.
11416 Contura 4/25cx Active Matrix Color with 120 MB, Windows	3159.
11415 Contura 4/25cx Active Matrix Color with 209 MB, Windows	3399.
11421 Contura 4/25 Mono with 120 MB, Windows ...	1949.
11420 Contura 4/25 Mono with 209 MB, Windows ...	2199.
11453 Deskpro 4/25is with 120 MB, Windows	1499.
11450 Deskpro 4/33i with 120 MB, Windows	1799.
11447 Deskpro 4/66i with 120 MB, Windows	2199.

COMPETITIVE UPGRADES

Please call for criteria to qualify to trade up for these popular products. Policies may vary depending on vendor.

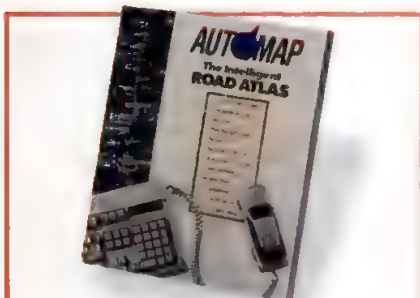
Aldus	
11033 FreeHand Windows Comp. Upgrd. (11034 3 1/2")	145
11038 Persuasion Windows Comp. Upgrd. (11039 3 1/2")	95
11036 PhotoStyler Win. Comp. Upgrd. (11037 3 1/2")	189
Approach Software	
3830 Approach for Windows Competitive Upgrade	95
Claris Corp.	
5228 FileMaker Pro 2.0 Competitive Upgrade	89
Microsoft	
5693 Excel 4.0 Competitive Upgrade (5695 3 1/2")	125
8353 PowerPoint 3.0 Comp. Upgrd (8352 3 1/2")	125
3881 Word for Windows 2.0A Comp. Upgrd. (7841 3 1/2")	125

SOFTWARE

AddStar	
8807 SuperStor Pro 1.0	85.
Adobe Systems	
10774 Adobe Photoshop 2.5 for Windows (3 1/2" only)	548
6591 Adobe Illustrator 4.0 for Windows (6439 3 1/2")	389
7940 Adobe Type Set Value Pack (7941 3 1/2")	39
(Entire Adobe Type Library available)	
AGFA	
10396 Discovery TrueType Pack	49.
Aldus	
1332 PageMaker 5.0 for Win. (April '93) (4247 3 1/2")	579
Aldus Corporation	
8675 Fontographer for Windows 3.5 (3 1/2" only)	259
Application Techniques	
8337 WinDings 1.0 for Windows	49
1214 Pizazz Plus 3.0	79.
Approach Software	
6598 Approach 2.0 for Windows	259
Area Software	
6030 FontMonger 1.06 for Windows	89
Artisoft	
2455 Lantastic AE-2 EtherNet Starter Kit 4.1	469.
2452 AE-2 EtherNet Adapter Card	199.
Automap	
2729 Automap USA for DOS... 55.	8569 Windows. 55
Avery Dennison	
6006 Label Pro 1.6 (Laser)	49.
Baler Software Corporation	
11312 Baler 6.0	279.
Banner Blue Software	
2088 Org Plus 1.0 for Windows	125
Berkeley Systems	
9885 After Dark 2.0 for Windows	29
6649 Star Trek: The Screen Saver (3 1/2" only)	34
Bitstream	
8040 FaceLift 2.0 for WordPerfect 5.0/5.1	69.
2089 MakeUp 1.1 for Windows 3.0/3.1	79
Borland International	
10616 Quattro Pro Win. (3 1/2" only) ... while supplies last	95.
10710 Paradox Windows (3 1/2" only), while supplies last	129.
11445 Paradox/Quattro Pro for Windows Bundle	189
Broderbund	
5900 PC USA 2.0	29.
8855 Print Shop Deluxe 1.0 (8856 3 1/2")	45.
Claris	
4130 Faxmaster 1.0 95.	8933 OmniPage Pro 2.1 629.
Central Point Software	
9751 Anti-Virus 1.4 (9555 3.5") or 8114 Backup 7.1 ea.	89.
5039 PC Tools 8.0 (1475 3 1/2")	125.
11394 PC Tools for Windows (11395 3 1/2")	125.
Claris Corp.	
10996 ClarisWorks for Windows (Apr '93)	95.
5257 FileMaker Pro 2.0 for Windows	119.
CompuServe	
7546 DOS Membership Kit 2.0	25.
10957 Windows Membership Kit 1.0	27
Concentric Data Systems	
6575 R/R Report Writer DOS 159.	9236 Windows 159
Contact Software	
7435 ACT! for Windows	239
Corel Systems	
5506 CorelDRAW! 3.0 (5508 3 1/2")	395
Data Storm	
4798 PROCOMM PLUS 2.01 69.	6918 for Windows 99

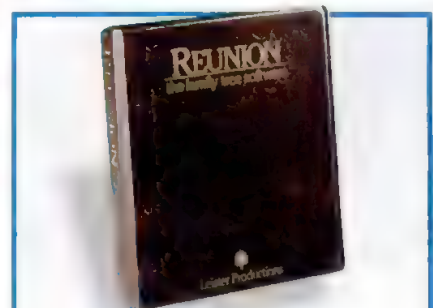
DCA/Crosstalk

5611 Crosstalk 2.0 for Windows	\$119
Delrina Technology	
5974 DOSFax PRO... 49.	2446 WinFaxPro 3.0... 79.
10454 Windows Communications PAK	145.
DeltaPoint	
10787 Animated Desktop 1.0 for Windows	42
5172 FreezeFrame 1.0 for Windows	62
Fifth Generation Systems	
7725 Direct Access 5.1	64.
3950 Fastback Plus... 95.	6431 for Windows... 95.
Fractal Design	
7822 Sketcher 1.0 for Windows	94.
Gibson Research	
9832 SpinRite 3.1	85.
Hewlett-Packard	
8731 Dashboard 1.0 for Windows	45.
IBM	
7303 OS/2 2.0 Upgrade from DOS (7305 3 1/2")	99.
Inset Systems	
7298 HiJaak 2.1... 115.	3820 1.0 for Windows ... 115
Intuit	
2426 Quicken 5.0... 45.	5596 for Windows ... 45
LaserTools	
6882 PrintCache 3.1	49.
9510 PrimeType 1.0 for WordPerfect	62.
Leister Productions	
11406 Reunion for Windows	135
Lotus	
5417 1-2-3 3.4 (5416 3 1/2")	399.
5653 1-2-3 2.4 (5652 3 1/2")	335.
2755 1-2-3 1.1 for Windows (2756 3 1/2")	309.
3424 1-2-3 1.1 for Windows Upgrade (3426 3 1/2")	111
5799 Ami Pro 3.0 239.	1847 Competitive Upgrd 111
3523 Freelance Graphics 2.0 for Windows (5005 3 1/2")	349.
10753 Improv for Windows (3 1/2" only) ... intro. price	99
1493 Organizer for Windows	99.
5981 SmartSuite (5982 3 1/2")	469
Maxis	
11370 Rome... 29.	11423 El-Fish (3 1/2" only) 35.
MECA	
2798 Managing Your Money 9.0	32.
Microcom	
6234 CarbonCopy Plus 6.1... 129.	4410 Windows 129.
Micrografix	
3627 Windows Draw! 3.0 (3628 3 1/2")	99
MicroLogic Software	
5350 TrueType 1.0 for DOS 49.	8579 MoreFonts 3.0 75.
Microsoft	
10051 Font Pack 2 for Windows	45
11324 MS-DOS 6 Upgrade (11325 3 1/2")	47.
7010 Windows 3.1 (7009 3 1/2")	89
6141 Windows for Workgroups Add-on (6172 3 1/2") ..	59.
2735 Works 2.0 for Windows	129
3337 Publisher 1.0 for Windows	129
1624 Visual Basic 2.0 Windows Standard Edition	129
11444 Visual C++ Standard Edition (3 1/2" only)	129
7387 PowerPoint 3.0 for Windows (8423 3 1/2")	299
6195 Word 2.0 for Windows (7811 3 1/2")	299
2856 Excel 4.0 for Windows (5680 3 1/2")	299.
8355 Access 1.0 for Windows (8326 3 1/2")	299
10056 FoxPro 2.5 for Windows (10057 3 1/2")	299
7388 Project 3.0 for Windows (11367 3 1/2")	445.
8137 Office 3.0 for Windows (8138 3 1/2")	449.
Nolo Press	
2982 WillMaker 4.0	35.



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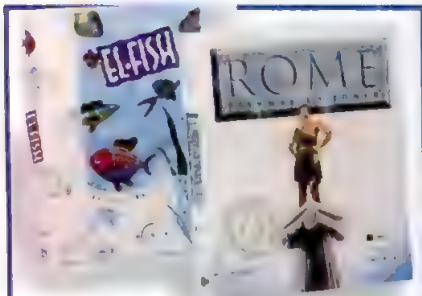
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11406 Reunion for Windows—The family tree software. Quickly record your family information and images. Create graphic tree charts and documents worthy of publication..... **\$135.**

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11423 *El-Fish (The Electronic Aquarium)*—The world's first virtual aquarium (3 1/2" only) 35.

Norton-Lambert	
2753	Close-Up Dual Pack 4.0 (2754 3 1/2")..... 125.
Panacea	
2413	WinSpeed 1.0 (Windows accelerator) 45
PC-Kwik	
8565	WinMaster 1.5 (8566 3 1/2")..... 65.
4925	PC-Kwik Power Pak 3.0 w/Power Disk (8004 3 1/2") 79.
Peachtree	
5757	Accounting 5.0 for Windows..... 79.
Personics	
9268	Laptop UltraVision 2.1 (3 1/2" only) 59.
Polaris Software	
4395	PackRat 5.0..... 249.
Portfolio Software	
10459	DynoDex for Windows..... 49
Power Up	
10582	myHouse 59.
Qualitas	
7539	386MAX 6.02 59.
Quarterdeck	
3221	Expanded Memory Manager 386 6.0 (3217 3 1/2") 59.
11413	QEMM-386 Game Bundle (3 1/2" only)..... 75.
4586	DESQview 386 2.4 (4585 3 1/2")..... 129
Reality Technologies	
6572	WealthBuilder 3.0 (includes Smart Investor)..... 94.
Shapeware	
5426	Visto 1.0 for Windows (3 1/2" only)..... 199.
Softnet	
5883	FaxWorks 2.5 (Windows & DOS) (3 1/2" only)..... 45.
Software Marketing Corporation	
5147	Orbits 1.0..... 36. 5145 Bodyworks 2.14..... 45.



DeltaPoint

5172 *Freeze Frame 1.0* for Windows—The "Must Have" graphics utility. Convert files, view and print, and screen capture. Also includes an icon editor/creator, 300 hi-res clip-art & wallpaper images..... \$62.

Software Publishing	
4403	Harvard Graphics for Windows (4402 3 1/2")... \$369.
Spinnaker	
1415	PFS: WindowWorks 2.0 (3 1/2" only) (thru 5/31/93) 39
Stac Electronics	
1409	Stacker 3.0 85.
Symantec	
6397	The Norton Backup 2.2 for DOS (2356 3 1/2")..... 99.
2359	The Norton Desktop 2.2 for Windows (2360 3 1/2") 115.
3146	The Norton Utilities 7.0 (5136 3 1/2")..... 115.
8378	Norton PC Anywhere 4.5 (8535 3 1/2")..... 119.
11304	PC Anywhere 1.0 for Windows (11303 3 1/2")..... 129.
TIMESLIPS	
5698	Timeslips Release 5..... 189.
Touchstone Software	
7420	Check It Plus 3.0 65.
Traveling Software	
4407	LapLink V 99.
Walt Disney Computer Software	
10100	Aladdin Print Kit 1.0 (3 1/2" only)..... 15.
9984	The Animation Studio 1.0 72.
WordPerfect Corporation	
4396	Grammatik V..... 55. 7483 for Windows 55.
3804	WordPerfect (3795 3 1/2")..... 269.
3494	WordPerfect for Windows (3497 3 1/2")..... 279
XTree	
8328	XTree 1.5 for Windows (8957 3 1/2") 65
6161	XTree Gold 2.5..... 95.

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3819	Back-UPS 250..... 115. 3858 Back 400 179.
7107	Back-UPS 450..... 215. 3823 Back 600 295.
Apollon ... limited lifetime	
2469	Thumbelina PC or 2480 MousePen Pro PC ea. 59.
ATI Technologies ... 5 years	
8463	VGA Wonder XL24 (with 1 MB) 149.
2012	Graphics Ultra (with 1 MB) 209.
3886	Graphics Ultra + (with 2 MB) 339.
3871	Graphics Ultra Pro (with 2 MB) 519.
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10468	SVGA3 (with Bit BCT acceleration) 149.
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7150	(4 MB) 239. 7138 (8 MB) 449.
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8380	BasicVGA..... 49. 8381 SuperVGA..... 115.
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8158	Typist Plus Graphics 299.
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7897	BubbleJet Ink Cartridge (BJ-10ex) 23.
11403	NoteJet (85 MB, 486 SLC Laptop and Printer) .. call
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9875	FasMath 83D87-25 or 9876 83D87-33 ea. 89.
Diamond Computer ... 5 years	
10079	Stealth 24 Graphics Accelerator 165.

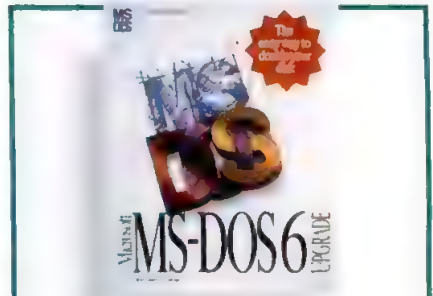
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4008	Win/TV 429.
10593	Win/TV, Microsoft Video for Windows Bundle... 459.
Hayes ... 2 years	
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7391	ULTRA 96 Modem..... 599. 5024 ULTRA 144 .. 669.
1345	OPTIMA 24 Modem 115. 3522 OPTIMA 96 .. 349.
8187	OPTIMA 24-FAX96 119.
7395	OPTIMA 144-FAX144 389.
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7620	DeskJet 550C (color) (with ink cartridge) 789.
6442	LaserJet 4 (with toner) 1499.
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3864	14.4EX Modem 469.
1086	Matched Memory Classic Memory Board OK 95.
8479	Above Board ISA OK 179.
10436	SatisFAXtion Modem/300 299.
5994	Modem/400..... 399. 5995 Modem/400e 399.
6003	FAXability Plus OCR (software) 159.
2994	EtherExpress 16 or 3021 16 TP ea. 129.
4750	80387SX..... 79. 5409 80387DX 85.



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3996	Trackman2 (combo) .. 79.	2343 Portable .. 99
7975	ScanMan 256.. 239.	1015 ScanMan Color .. 569.
3295	Mouseman (combo) ... 69.	9766 (cordless) 89.
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7873	Fusion CD 16 (internal)	519.
5638	MultiMedia PC Upgrade Kit 16	969.
10735	CDPCXL	1099.
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5729	ProTracer (personal CAD printer) (1 yr.) ..	1099.
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4430	FaxModem AFX (2400 baud 96S/48R)	69.
4429	FaxModem VFP V.32bis 14,400 baud (internal) ..	199.
4428	FaxModem VFX V.32bis 14,400 baud (external) ..	239.
7921	Pocket FaxModem	87.

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4354	Jumbo 250 Tape Backup	215.
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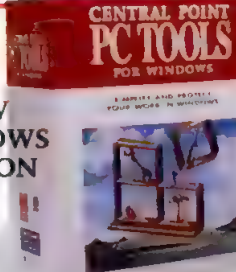
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10537	PC Powered 150	799.
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2500	PC2B-2 Controller	149.
2530	90 MB Cartridge	149.
2467	Tripak	439.
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8481	Tape250 Insider Half-High Tape Backup	209.
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helpful security features. It also has a remote log-on capability for flexibility when managing your network. Its administrative features, however, are somewhat sketchy, as is its internetworking support. SilverNET holds its own against the competition in terms of price; the hardware and software costs \$299 a node.

SilverNET supports both DOS and Microsoft Windows and requires approximately 18K of RAM for client workstations and 40K for peers or servers. It per-

with all its usual capabilities.

Since SilverNET uses the drivers included in Windows, installation was remarkably simple. We just added MS-Net for the network setup. This is done through Windows Setup. Only a few lines are added to the SYSTEM.INI file during installation.

Even the adapter configuration was incorporated into the installation process. Once you select your network adapter card from a checklist, the program senses open interrupt settings, and with the use of on-screen diagrams, it shows what the jumpers settings should look like on the board. The package supports ARCnet and Ethernet LAN topologies. You may also use Token-Ring drivers from third-party vendors, and any NetBIOS-compliant driver will work. No Macintosh support is offered.

SPEEDING UP PRINT JOBS

SilverNET gives users a typical level of control over their printers. Users may view queues and status-report screens, change priorities, and delete jobs. Queues may also be viewed from within Windows Print Manager. With the proper password, users can set up form controls, form feeds, and title-page options on shared printers. And the Immediate option lets the printer begin data processing even before the originating application releases the print job, much

as LANtastic and 10NET's Hyperprinting technology does. SilverNET also lets you redirect the print queue up to 16 times, which means you can share a large number of printers from a single server.

As with almost every package we saw, SilverNET's e-mail system is rudimentary. There are no cut-and-paste capabilities, nor can messages be sent to multiple recipients or storage folders. Sender may attach a single file to each message. The LAN passes a message through any application to the recipient, who may then save the message to disk as an ASCII file. SilverNET

FACT FILE

SilverNET, Version 2.0M

*Net-Source Inc., 1265 El Camino Real, #101,
Santa Clara, CA 95050; 408-246-6679;
fax, 408-246-7040*



List price: Two-user 16-bit version, \$649. Single-user 16-bit version, \$299; two-user 8-bit version, \$599, single-user 8-bit version, \$279. Software: Single-user version, \$99, 254-user version, \$1,999

Requires: 41K RAM (server), 18K RAM (client), or 41K RAM (peer); 830K hard disk space; NetBIOS-compatible network card, Microsoft Windows 3.0 or later

In short: SilverNET offers excellent speed, ease of use, and interoperability. But it lacks Token-Ring support, UPS monitoring, and workgroup-type features.

 500 ON READER SERVICE CARD

does not offer any BBS-type capabilities such as public message threads. The package's chat mode notifies users of pending chats by beeping and showing a pop-up screen. Chats take place in real time, and users can "speak" simultaneously, just like in real life. More than one user may participate in a chat.

SilverNET's administrative functions don't compare well with the competition's. Each node on the LAN has the primary responsibility for setting access to its own resources. The remote log-on feature allows another node with supervisory rights to set access rights as well, but these capabilities are minimal in comparison with those offered by other vendors.

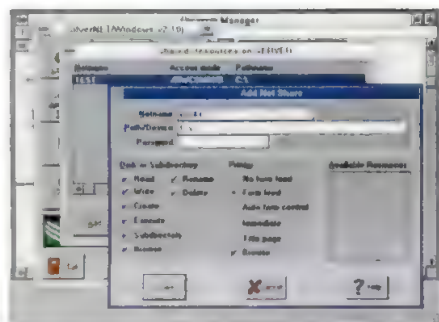
Rights to shared resources can be limited to the directory and subdirectory level, but not by individual files. You may limit access to the Browse, Create, Delete, Execute, Move, Read, Rename, and Write options, or some combination of these. You may also control shared resources with password protection.

Interoperability is becoming increasingly important for peer-to-peer LANs, and SilverNET meets this challenge with ease. In terms of interoperability, SilverNET performed all of the tasks, with few complications. Because we used a NetWare 3.11 server, we had to run IPX, NetBIOS, and NETX, along with SilverNET's NW TSR; we also had to add

SUITABILITY TO TASK				
SilverNET				
	POOR	FAIR	GOOD	EXCELLENT
Communications	●	●	●	○
Resource sharing	●	●	●	○
Small-office usage	●	●	●	●

formed admirably on informal printing and CD-ROM tests. Like the rest of these packages, it offers no modem support, but any third-party communications server with NetBIOS support can be used.

Application sharing was simple for both peer-to-peer and workstation configurations, but new nodes do not automatically advertise the peripherals they are sharing. As with most of the reviewed peer-to-peer packages, SilverNET peers automatically connect or reconnect to peers as they join, leave, and rejoin the network. And as with most LANs, files drawn from a particular server are orphaned if that server is taken down. We found that SilverNET's autoreconnection was not well-implemented under Windows; we had to use the DOS prompt.



SilverNET lets the administrator configure a new shared resource on just one screen.

SEAMLESS INTEGRATION

Windows integration was painless as well as seamless. A group of icons, which are presented in a button palette, initiate all the functions. You may link sounds to the buttons. The icon bar does not support drag-and-drop functionality; however, Windows' File Manager may still be used

Peer-to-Peer LANs

OS/2 2.0 support to the NetWare server, which also eliminated the use of any 286-based NetWare server.

After we did all this, we could communicate with both the NetWare server as well as the SilverNET workstation. Since SilverNET and Microsoft LAN Manager both use the SMB protocol calls, they can be connected almost seamlessly and share resources with no difficulty. However, SilverNET's documentation includes no information on configuring the peer-to-peer LAN to connect with any of these network operating systems.

During our testing, SilverNET's scores were average and occasionally slightly above the average. SilverNET's performance hinges on SilverCache, which caches reads and writes to the server's hard disk, and to NetBEUI, which negotiates the number of packets to be sent to and from the server. Both the cache and NetBEUI can be tuned for peak performance on networks of any configuration.

If SilverNET is to become a front-runner in the tumultuous peer-to-peer market, Net-Source will need to improve SilverNET's network administration facilities and add better support for inter-networking. But easy installation, good documentation, interoperability, speed, and ease of use make SilverNET an interesting and well-rounded product.

Tiara Computer Systems Inc.

10NET

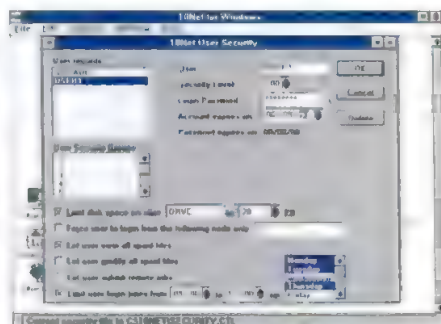
BY PADRAIC BOYLE

For a combination of speed, print management, and price, Version 5.1 of 10NET can't be beat. Boasting such features as tightly configurable security, disk threshold monitoring, interoperability, and UPS support, it scored high in both usability and on our benchmark tests.

Tiara Computer Systems makes 10NET available for both DOS and Microsoft Windows PCs. 10NET cannot

dedicate a server. A workstation sharing none of its own resources requires 28K of memory; a file server uses 41K, a print server needs 41K, and a PC providing for printers and files requires 57K.

10NET is able to use upper memory to load its drivers. With any memory manager, 10NET can auto-sense available memory above 640K. A system called "scatter loading" lets 10NET use whatever memory blocks it finds open, rather than require contiguous memory space for loading the entire program. On a 386-based system that has 1MB of RAM and uses DOS 5.0 and the EMM386 memory manager, 10NET will use as little as 256 bytes of conventional memory, leaving the rest available for running more memory-intensive programs.



The excellent security in 10NET is easily configurable at the user and group levels.

The package provides support for sharing printers and CD-ROM drives. It supports shared modems through any third-party product that supports NetBIOS. To share a printer, you might set up a workstation to share the queue and printer connected

locally with the rest of the LAN, or you could set one workstation to handle the queue while another does the printing. These configurations are useful for distributing the load, but they can also make a "simple" LAN a complex one. Tiara offers Ethernet and ARCnet adapters, and concentrators for both topologies.

File sharing between servers and workstations was easy and did not have a significant impact on the server's performance. Like most of the other packages we tested, workstations can automatically reconnect to downed servers as soon as the servers rejoin the network. Nodes joining the workgroup announce their availability with a pop-up message and a beep. Servers can be warned before log-off if other nodes are using their re-

FACT FILE

10NET, Version 5.1

Tiara Computer Systems Inc., 1091
Shoreline Blvd., Mountain View, CA 94043;
800-638-4272, 415-965-1700;
fax, 415-965-2677



List price: Two-user version, \$699, single-user version, \$329
Software: Single-user version, \$249
Requires: 57K RAM (server), 28K RAM (client), or 57K RAM (peer); 1MB hard disk space.

NDIS-compliant network card; Microsoft Windows 3.x
In short: 10NET offers superior security functions, printer spooling, and speed. It doesn't come with e-mail, but it does support major e-mail packages.

This package is a tough contender at a decent price

500 ON READER SERVICE CARD

sources, and workstations are warned that the server may be leaving the network. But like most of the other packages we tested, 10NET had some difficulties with reconnection: If the server is switched off and on, the workstations must reboot to re-establish the connection. Also, newly added nodes cannot broadcast their available resources.

Of all the packages we saw, this latest version of 10NET alone does not contain its own e-mail utility. It does support all the mainstream e-mail packages such as cc:Mail, Da Vinci eMail, and Microsoft Mail. A chat utility lets you communicate with one or more network users. The network supplies a list of currently logged on users, and users may shut off their message capability if they wish to work without interruption.

The Windows interface uses icons to represent the various network functions. After connecting to a server, you may navigate through the attached drives by using Windows File Manager. You view

server resources by clicking on the Browse icon, and you can easily view available servers and their resources through the Windows interface. Other icons lead

SUITABILITY TO TASK				
10NET				
	POOR	FAIR	GOOD	EXCELLENT
Communications	●	●	○	○
Resource sharing	●	●	●	●
Small-office usage	●	●	●	●



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Nothing comes close.

Peer-to-Peer LANs

you to screens for viewing active users, monitoring network use, and even performing basic troubleshooting.

Multiple printers can support a single queue, and vice versa. If a printer is busy, 10NET can automatically route your print job to another printer. The package will even warn users when a printer has jammed or run out of paper. Like LANtastic, 10NET uses a technology called Hyperprinting, which lets a job start printing even before it is entirely released by the application. This allows large or complex jobs to get a head start at the printer. The package combines Hyperprinting with a file-compression capability that further enhances its high-speed printing. It also shows the usual printer information, including the queue status, job owner, job status, and job size.

BLANKET SECURITY

The package's administration is broken into share, security, and audit utilities. Its security sets up any access restrictions that you wish to apply to server resources and devices, and it can add groups, users, and passwords. You can configure the security to be as stringent as you want, and apply it to directories, subdirectories, and individual files. The auditing feature lets you monitor log-ons and log-offs, server uptime, and failed log-on attempts. And one of its best features, disk threshold monitoring, lets administrators set limits and keep tabs on the amount of disk space available on each server. When the threshold is reached, 10NET alerts the users. UPS support is another plus.

The package has excellent connectivity with other types of networks. Though we did not test it, software sold by Tiara allows connections to a NetWare network. NetWare-based resources appear as Tiara-based resources. Tiara recommends a dedicated PC for use with the 10NET-to-NetWare software. NetBEUI lets you connect to other peer-to-peer packages such as Microsoft Windows for Workgroups and SilverNET, as well as to Microsoft LAN Manager. During our testing, 10NET communicated with our LAN Manager server with no difficulty. For the moment, those requiring Macintosh connections can use MacLAN to link their 10NET network to Macs. RS-232 bridges are also available.

On our benchmark tests, 10NET turned in outstanding scores, mainly because its finely tuned drivers made the most of Ethernet's capabilities and of 10NET's disk-caching utility. It produced the highest throughput on our 1K-block Non-Dedicated Server test, and on the 4K-block test it tied for first place.

This package offers an elegant, secure solution for both small networks and larger, more complex LANs. If the product you need must fit virtually any networking scenario for your company's ever-changing LAN, 10NET is worth your time.

Webcorp

WEB for Windows and DOS

BY STEVEN C. M. CHEN

Version 4.0 of Webcorp's WEB for Windows and DOS features excellent performance and strong NetWare compatibility. The Microsoft Windows front end for the DOS package is not particularly well implemented, however, and NetWare administrators concerned with network security should be wary of WEB's unencrypted passwords.

Since WEB incorporates the NetWare-compatible IPX/SPX shell, it allows seamless access to NetWare servers without an additional protocol stack. But NetWare servers may be used only as resources—that is, as shared hard disks like any others on the network. You can't access server-based applications running on the NetWare server. WEB offers no Macintosh support.

WEB's Station Manager concept is different from those of other peer-to-peer network products, since it keeps track of the networked PCs themselves rather than of their users. This eliminates the ability to organize workgroups by their members (such as the staff of the payroll department). Remote management is virtually absent, except for server status.

A WEB client requires around 30K of RAM, a peer unit 40K, and a server a whopping 300K. Since NetWare's structure defines the index of user names, up

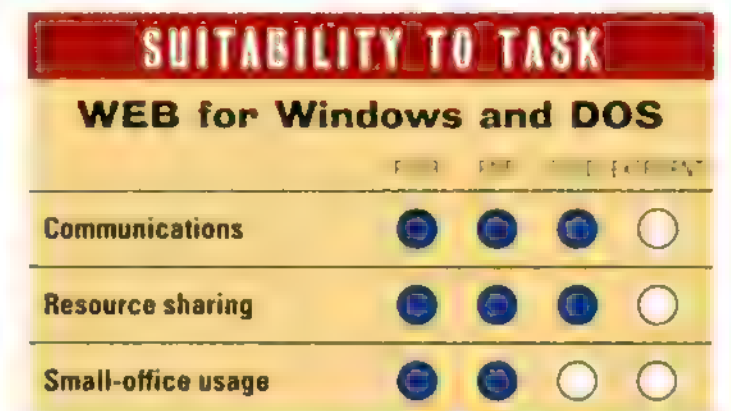
to 255 WEB nodes are supported. WEB automatically controls license restrictions by serial number.

WEB is a software-only package that runs over any NetWare-compatible network adapters. Prices start at \$99 per node and range to a 100-user

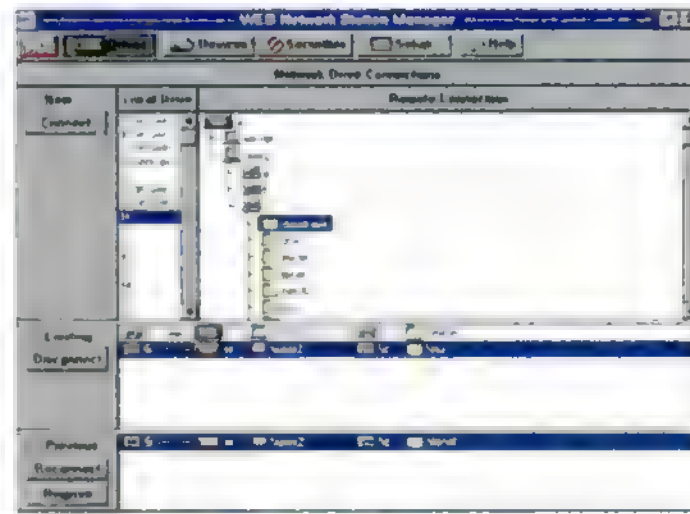
license. You may have a difficult time finding WebCorp's software, however, since it is usually sold by third-party hardware vendors with their own network adapter cards. At the time of this writing, WEB is sold by Buffalo Products (503-585-3414), as Buffalo Complete Network.

EASY RESOURCE SHARING

Autoconnection, e-mail, and CD-ROM and printer sharing are standard with WEB. Modem sharing requires third-party software such as Cross+Connect, from Cross Communications Co. To make a connection, just highlight the resource and the drive letter to which you wish to assign it, and click on the Connect button. You can easily disconnect an ex-



isting connection or reassign a previous one; WEB keeps track of connection histories. Servers are not warned if they try to log off the network when clients are using their resources; the clients do hear a beep, however. As do all the products we saw, the package supports autoreconnection. A similar procedure is used for connecting a printer. WEB creates a drive, called the W: drive, on which all the available network servers are listed as directories. Under each server it lists



To map a drive with WEB, highlight the source and local drive letter and click on the connect button.

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- Hot-sparing and background data rebuild for zero downtime
- Three independent power supplies with redundancy
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Peer-to-Peer LANs

all the available drives as subdirectories.

Station Manager is best at managing individual stations. In order to manage other servers, you must run the setup program locally on each server. This can be time consuming if you're managing a number of servers.

You use Windows Print Manager to check the status of print jobs. We liked WEB's spooler program, PCSPool, which allows print jobs interrupted by their originator's log-out to resume when the station comes back on-line. You cannot sort print jobs by priority.

WEB uses its own e-mail program. It can file messages to disk, print mail, and reply to messages. There is also a pop-up notification option. Unfortunately,

installation lets the user fine-tune the server to increase performance, but this requires additional hard disk space. Both setups record the specific installation parameters and load the appropriate networking modules for each node.

You can institute several security levels. Two password-protection levels are available: One regulates access to the network itself, and the other regulates access to the various setup and management utilities. You can individually password-protect directories, subdirectories, and files. In addition, directories and files can be set for read-only access, or they may be hidden from the network altogether.

THE NETWORK CONNECTION

WEB offers one of the easiest ways to access NetWare servers—one that's even easier than NetWare Lite's method. Each WEB node uses the W: drive to display a listing of the available WEB and NetWare servers. To log on to a server, you select it from the list and enter the appropriate password. You need not run NETX to log on. This is an improvement over NetWare, which does require you to load NETX.

NetWare's servers are available to WEB nodes as file servers. At least one NetWare server must be on-line before any WEB stations can join the NetWare network, and NetWare cannot accept encrypted passwords from a WEB node. Because WEB's NCP (NetWare Core Protocol) implementation doesn't yet support Novell's APIs, you must load the NETX shell in order to run NetWare-specific utilities. TCP/IP support is available only for FTP Software's PC/TCP Plus, which requires a separate packet driver. WEB's NetWare access is more developed than that of NetWare Lite but needs further refinement.

Performance is one area in which WEB shines. Using its own version of burst mode (which is incompatible with NetWare's), it can send up to 127 packets at once. WEB's data compression also helped it achieve decent test scores.

WEB offers seamless integration into a NetWare network. Its performance is certainly on a par with that of any LAN we tested. Unfortunately, weak management capabilities make WEB less suitable for large networks. □

FACT FILE

WEB for Windows and DOS, Version 4.0

Webcorp, 2750 Bridgeway, Sausalito, CA 94965; 415-331-1449; fax, 415-331-0911



List price: Single-user version, \$285; 2-user version, \$495; 5-user version, \$1,275; 10-user version, \$2,475; 15-user version, \$3,675; 30-user version, \$6,450

Software: Single-user version, \$99; 2-user version, \$198; 5-user version, \$449; 10-user version, \$765; 15-user version, \$975; 30-user version, \$1,495

Requires: 300K RAM (server), 30K to 55K RAM (client), or 40K RAM (peer); 1MB hard disk space, ODI-compatible network card, Microsoft Windows 3.x

In short: This product easily connects to a NetWare server, and it offers decent speed. But its network-wide management features are sketchy

 ON READER SERVICE CARD

there is no on-line help for the program. It's clear that LAN users may quickly outgrow this package and should note that cc:Mail can be used with WEB. The package doesn't offer a chat feature.

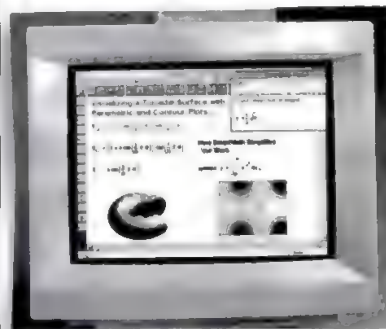
Installation is straightforward, and both the node and its resources show up automatically on the network. The basic installation is undertaken through Windows, and the user need only select the network parameters, such as the amount of memory to be allotted to caches and buffers. The WEB icons are generated when Windows is restarted. Advanced

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DIGITIZING TABLETS

Precision Input

More than just pointing devices, these 11 small-format digitizing tablets will help boost precision and productivity for both the power CAD user and the graphic artist.

by Rock Miller

Sometimes a mouse just isn't enough. Take CAD, for instance. Creating or duplicating even a fairly simple drawing requires that you pick from dozens of functions offering the exact shape or tool you need. Unfortunately, these functions aren't always artfully arranged on menus, and the lack of standardization in the CAD world can make each interface an object of painful study and frequent uncertainty. If you're stuck wading through CAD menus with a mouse, you're not using your workstation to its fullest potential. A digitizing tablet can help soften the rough edges.

A digitizing tablet is more than just a pointing device. With prices ranging from \$199.95 to \$1,347 for the 11 small-format units we tested, tablets are more costly than mice or trackballs, and their footprints tend to eat up desk space. But in return, digitizers give CAD and other precision-graphics users a productivity and capability boost that simpler devices can't match.

Digitizers let you customize your CAD work environment through templates—active buttons or areas that activate menu



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functions or preprogrammed macros when tapped on or pointed at. (Think of the digitizer as a customizable extension of your CAD interface—and a place to put icons without using up screen real estate.) Such templates can cut your actions to half or even a quarter of what they would otherwise be, according to a Summagraphics Corp. study. Equipped with a penlike stylus, digitizers also offer more natural, and precise, freehand drawing capabilities than other input devices do.

A digitizing tablet is essentially an electronic version of pen and paper. Consisting of a flat tablet and penlike stylus or flat “puck” cursor, digitizers work by detecting the position of the pointing device on the tablet surface and converting it into *x,y* coordinates within a fixed coordinate space. The resulting coordinate space is absolute: The center of the tablet is always the center of the drawing space; moving to the edge of the tablet (or a defined section of it) moves the cursor to the edge of the drawing space.

Since CAD is based on just such a precision coordinate space, a digitizing tablet goes with CAD like butter with bread. Rather than entering numeric coordinates or settling for the approximate locations you can manage to identify on your relatively low-resolution monitor, you can, with a digitizer, precisely identify or create specific points by pointing on the tablet. That's why draftspeople and cartographers use digitizing tablets for tracing paper images such as blueprints and maps.

Tablets are also used for transferring key points from raster images such as satellite photos. Such methods are labor-intensive, but in the end offer more control over results than automated methods of raster-to-vector conversion, which rely on large scanners and imperfect software.

Designers also find tablets handy for working out conceptual ideas: Sketching on the paperlike surface of a tablet with a stylus is more natural than using the powerful but stultifying geometric functions of typical CAD software (provided,

Our Contributors: LUISA SIMONE is a contributing editor to *PC Magazine*. JOSEPH DESPOSITO and ROCK MILLER are frequent contributors to *PC Magazine*. WILL SCHLETER is a mechanical engineer and a free-lance writer. EVAN YARES is a consultant with Design Automation Systems and a free-lance author. JENNIFER ZAINO was the associate editor in charge of this story, and MICHAEL J. ZULICH was the project leader.

HIGHLIGHTS

Digitizing Tablets

SMALL-FORMAT digitizing tablets are more than just pointing devices: These electronic versions of pen and paper give CAD and other precision-graphics users a productivity and capability boost.

ACCOMPANIED BY a cursor, digitizing tablets aid in precision digitizing and geometry creation. Equipped with a pen-like stylus, they offer a more natural approach to sketching and freehand drawing.

WHILE A SMALL-FORMAT digitizing tablet won't replace the mouse for the average user, all of the products in this roundup let your cursor or stylus emulate a mouse so that you can use it as a relative pointing device.

WITH THEIR SUPPORT for pressure-sensitive styli, digitizing tablets from CalComp, Kurta Corp., and Wacom Technology Corp. will appeal to graphic artists. A pressure-sensitive stylus lets you emulate fairly convincingly the range of strokes and effects possible with pen, pencil, and charcoal.

THE TABLETS we review in this roundup range in price from \$199.95 to \$1,347. All of them claim resolutions of at least 1,000 lines per inch and accuracies of at least 0.02 inch. During testing, most of them lived up to or exceeded their accuracy claims; the Hitachi Puma Plus and the Wacom SD-421E were the most accurate in testing, each at 0.002 inch.

of course, that your software supports this kind of freehand sketching). Better yet, your digitized sketches start out in editable vector form and so can be fine-tuned or worked up into engineering drawings with relative ease.

Graphic artists have discovered the benefits of penlike pointers over mice for translating ideas into computerized form. CalComp, Kurta Corp., and Wacom Technology Corp. offer special pressure-sensitive styli designed for just this. When used with a paint or drawing program that supports it, a pressure-sensitive stylus lets you emulate the range of effects possible with pen, pencil, and charcoal. For more information in this area, see the sidebar “The Artist's Touch.”

REVIEW CRITERIA

In this review, we look at small-format tablets. Sizes range from approximately 12 by 12 active inches to 12 by 18 active inches. We required that they support a resolution of at least 1,000 lines per inch

and a claimed accuracy of 0.02 inch or better. (Altek Corp., Computer Talk, and Kontron Elektronik had products that met these criteria, but they could not supply them in time.)

Small-format digitizing tablets are most popular for CAD workstation use. Small enough to fit on a desktop, they are primarily used for their productivity-boosting templates, though they are precise enough for sketching and digitizing small drawings. All of the units in this roundup come with AutoCAD (real-and/or protected-mode) and mouse-emulation drivers. Most are based on electromagnetic technology, with which a grid of wires beneath the tablet's hard drawing surface detects the position of a coil within a movable cursor. The Scriptel and GTCO products rely on the less-common, resistive electrostatic method.

For ordinary purposes, an accuracy of 0.02 inch and a resolution of 1,000 lines per inch is sufficient. The accuracy of a tablet is the degree to which the physical point marked by the cursor or stylus matches the corresponding point within the electronic coordinate space. Resolution is a measure of how many of these points the circuitry can distinguish within an inch. A tablet can't be more accurate than its resolution allows, but the accu-



EDITORS' CHOICE

racy can be degraded by factors such as temperature variations. All but two of the reviewed tablets have a 0.01-inch accuracy specification. The Wacom SD-421E claims a 0.006-inch accuracy, and the Hitachi Puma Plus is rated for a 0.02-inch accuracy. The majority have resolutions close to 1,000 lines per inch. The notable exception is the Numonics GraphicMaster II, with a resolution of 5,000 lines per inch (though no applications currently support this high a resolution).

In accuracy testing, most units delivered results close to or a little better than their claimed specifications. The most accurate tablets we saw—the Hitachi Puma Plus and the Wacom SD-421E—delivered results of 0.002 inch. The Acecad D9000+ was accurate to only 0.05 inch.

If you regularly deal with precision maps or E-size blueprints, you'll want to look at large-format digitizers instead. The high-end devices in this group are built to high standards of precision (they have claimed accuracies of 0.002 to 0.005 inch); not surprisingly, they cost much more than their smaller cousins. For more information on large-format tablets, see the sidebar "Large-Format Digitizers." Also available are minitables that are useful primarily for graphic artists. Some products in this market are KYE International Corp.'s \$229 9- by 6-inch HiSketch 906, Acecad's \$129 5- by 5-inch Acecat, and CalComp's \$395 7.5- by 7.5-inch DrawingPad.

STYLUS OR CURSOR?

A pen, or stylus (which looks like an over-weight pencil with buttons), is best for sketching and freehand drawing. Most vendors that offer styli also provide inking options for marking (the exceptions are Hitachi America, Numonics Corp., and Scriptel Corp.). For precision digitizing and geometry creation, a flat puck-type cursor with crosshairs is preferred; the crosshairs let you identify and lock in points precisely on the tracing surface.

Either type of pointing device can be used with templates, though cursors (which can contain up to 16 programmable buttons) offer more one-click functions than pens (which are usually limited by ergonomic necessity to just one or two buttons). The shape of the cursor and the

arrangement of the buttons are important for individual productivity; be sure to check both out before buying.

Tablets usually come with a variety of pointer options. The CalComp DrawingBoard II is perhaps the most prolific; you can choose from ten styli and cursors; a choice of three or four options is more common, however. The Jameco KD4000 is the only unit to lack a stylus (but a third-party stylus is available). Having a good selection of pointing devices ensures that your investment retains its

- **CalComp DrawingBoard II**
- **Hitachi Puma Plus**
- **Kurta XGT**

Among these small-format digitizing tablets, the Kurta XGT—with its \$850 list price and \$650 street price—doesn't compete on cost. The tablet instead wins an Editors' Choice designation for its wealth of features and excellent performance.

Among its virtues is a cordless stylus that supports up to 256 active levels of pressure sensitivity; currently, only the Kurta XGT offers firmware settings to customize the feel of the pressure-sensitive pen. The comfortable 16-button tethered cursor has an over-size 1.5-inch aperture and crisp crosshairs that bode well for critical digitizing. And its 0.005-inch tested accuracy easily exceeded its 0.01-inch specification. Further flexibility is assured by a full range of emulations and excellent drivers. An optional \$100 drop-in magnifying lens reduces eyestrain.

The CalComp DrawingBoard II also earns an Editors' Choice. At \$645 (\$500 on the street) with a cordless option for \$495 (\$375 on the street) as a tethered device, the CalComp is more moderately priced than the Kurta. The company offers ten different cursors and styli; all the cursors are comfortable to use, with medium-weight crosshairs appropriate to the unit's 0.008-inch tested accuracy. The pressure-sensitive stylus can sense and output the angle and direction at which it is being held, a feature that

will become more important to graphic artists as application support grows. Drivers are up to date, and switching modes is simple.

The \$449 (\$320 on the street) Hitachi Puma Plus is an elegant and inexpensive option. You get a well-designed tablet and input devices, and an extra-long cord for connecting to the serial port. It supports all the popular emulations, drivers function without problems, and it deviated only 0.002 inch during testing.

CLOSE BUT...

The \$599 (\$300 on the street) Summagraphics SummaSketch III has ergonomic-design improvements and optional subtemplates to add symbols to drawings. But Summagraphics lags behind the leaders with its AutoCAD drivers. The \$359 Acecad D9000+ (which can be purchased via mail order for \$250) has solid drivers and can have two corded transducers active at once. But the four-button cursor suffers from crosshairs that cast distracting shadows, and the unit could manage only a 0.05-inch tested accuracy.

value even if your needs change.

CalComp, Kurta, and Wacom, the leaders in pressure sensitivity, offer cordless tablets using technology that allows bidirectional communication between tablet and transducer. These designs represent the ultimate in pointer ergonomics: What better way to keep the cord out of your way than to eliminate it? But cordless devices are easier to lose, and the technology adds a layer of expense and complexity that may not be warranted. Cordless tablets are at their most alluring

Digitizing Tablets

in environments (such as graphic arts) where you need freedom of movement.

TABLET TALK

Small-format tablets typically attach to your computer through a serial port, which permits the necessary bidirectional communications according to the RS232C specification. Only two tablets we tested—the GTCO Ultima and the

Numonics GraphicMaster II—actually draw power from the serial port; the rest use a separate power source, either built in or external.

With the exception of the Scriptel RDT-1212, all the tablets we saw have smooth opaque plastic surfaces, which is fine for most applications. Clamps or overlays do a reasonable job of holding templates and documents down to the

surface. If you do a lot of tracing, however, you may prefer a tablet with an electrostatic surface, which uses static electricity to cling to the paper while you trace. Transparent tablets (such as the Scriptel unit) and translucent tablets both let you trace from transparencies or X-rays, or backlight detailed blueprints.

Also consider the tablet's sensitivity to the proximity of the pointer. The far-

▪ Large-Format Digitizers

by Evan Yares

Small-format digitizing tablets are fine for menu picking, macro selection, and even sketching, but if your needs are more extensive, you probably require a large-format digitizing tablet. Large-format devices include units with active areas ranging from just over 12 by 18 inches to more than 44 by 60 inches. Though they're not cheap, these products nevertheless offer the least-costly way to digitize large architectural drawings or precision maps. They are usually available from the same vendors that make the small-format units reviewed here.

Large-format digitizers are rated along the same specifications as their small-format counterparts, but with different emphasis. For example, it's unlikely that you'll use a three foot-wide digitizer in lieu of a mouse, so mouse emulation is less important. But accuracy can be a greater consideration simply because of the more critical nature of some applications for which large-format digitizers may be used. Choosing the right large-format digitizer is a matter of picking the appropriate size and deciding whether or not accuracy is critical.

Standard blueprints—the typical fodder for these digitizers—range up to E size, or an active area of 36 by 48 inches. Some companies standardize their drawings to D size, or 22 by 34 inches. These drawings are accommodated by tablets built to the architectural D-size specification of 24 by 36 inches.

The large format-digitizer market is divided between those who need high-accuracy tablets for critical use and those who can use lower-accuracy tablets for less-sensitive applications. Users involved in critical applications such as digitizing artwork for printed circuit boards or critical maps and aerial photos will want at least a 0.005-inch accuracy.

High-end digitizers—particularly the large-format versions of the Altek Datatab from Altek Corp. (301-572-2555), products in the CalComp 9500 series, and the Summagraphics Microgrid III—tend to be very consistent in accuracy. Each is available certified to a 0.002- or 0.003-inch accuracy; accuracy is verified by testing them on a laser interferometer or a coordinate measuring machine, which can measure within a ten-thousandth of an inch. Tablets such as the GTCO Super L II, the Kurta XLC, and the Numonics AccuGrid can be ordered calibrated to a 0.005-inch accuracy. While GTCO Corp., Kurta Corp., and Numonics Corp. have traditionally done the calibration for products in these lines by hand (which often results in less-precise accuracy), most vendors either have recently switched to using coordinate measuring machines or plan to. High-end digitizers are also more apt to have special digitizing cursors with oversize glass sights, extra-fine etched crosshairs, and optional magnifiers.

But precision doesn't come cheap. The 36- by 48-inch Microgrid III, with a 16-button cursor and calibration to

0.002 inch, costs \$5,379. The equivalent CalComp 95480 sells for \$5,305. With a 0.003-inch accuracy, the otherwise equivalent Altek Datatab goes for \$5,895. Near the high end is the \$11,598 CalComp 95602, a 44- by 60-inch backlit unit with a 0.002-inch accuracy, a 16-button cursor with a magnifier, an LCD coordinate read-out, universal formatting firmware, and a power lift base. E-size tablets with 0.005-inch ratings usually cost from \$3,500 to \$4,500; the GTCO Super L II lists at \$3,395, the Kurta XLC at \$4,595, and the Numonics AccuGrid at \$3,695.

With some applications for large-format digitizing tablets, price might be considered more critical than accuracy. For example, anyone digitizing from blueprints doesn't need the highest accuracy; paper isn't a dimensionally stable source to begin with. Today, almost every large-format digitizer manufacturer offers a large-format tablet (with the notable exception of Hitachi America) with a 0.01-inch accuracy. Generally, 0.01 inch-accurate E-size units cost from \$2,200 to \$2,600.

GTCO and CalComp even make special, thin flexible tablets (GTCO makes the Roll-Up Digitizer and CalComp makes the EstiMat, \$2,245 and \$2,395, respectively, in their 36- by 48-inch versions) with a 0.01-inch accuracy just for construction estimating. These can be rolled up and stuck in a shipping tube; at a job site, they can be unrolled onto a sheet of plywood and plugged right into a notebook computer. □

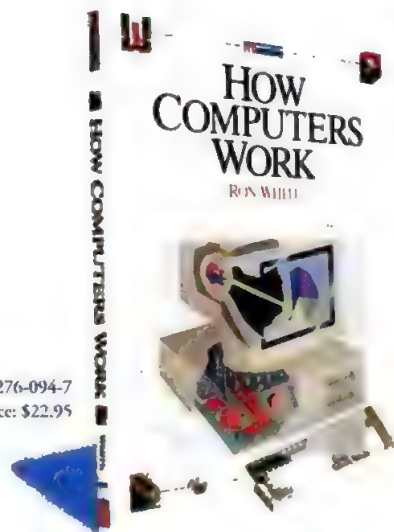
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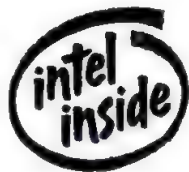
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HARDWARE

Digitizing Tablets

ther away the pointer can be detected, the more useful the tablet is for tracing from books and magazines. It's then harder, however, to get the pointer out of range.

Tablets transmit locational data to your PC in either ASCII or binary form, but getting your application to recognize this stream of numbers requires drivers. Basic DOS-level drivers let your cursor emulate a mouse so that you can use it as a relative pointing device.

In addition, Microsoft Windows for Pen Computing Extensions lets you use your digitizer stylus as a gesturing tool as well as a pointing tool. Pen movements have velocity and direction as well as location. Most digitizer applications only care about the latter, but Pen Windows uses direction information to concoct a set of standard "gestures" that are meaningful. For instance, moving the pen so as to "scratch out" existing text (which would make a standard copy-edit deletion mark if done with a pen on paper) is interpreted as a "delete" command. But though the Macintosh supports digitizers as a matter of course, there is no PC operating system standard for the complex transactions required by the digitizer's absolute coordinate space. And, naturally, the details of the macro commands on which tablet templates depend are application-specific.

Drivers and templates for market-leading AutoCAD are universally supported, but if you use another program, you'll find that such support can't always be taken for granted. Ideally, your CAD or GIS (Geographics Information Systems) package will support your tablet directly, but if it doesn't, all these tablets emulate Summagraphics products.

Ease of tablet configuration and calibration are also important considerations. Most tablets come with utilities or built-in routines that let you adjust the size of the digitizing area; this lets you map the absolute display area to a small portion of your tablet, leaving the rest available for template buttons. You'll also want to be sure that your CAD software makes it easy to reprogram and customize the tablet regions.

A small-format digitizing tablet is an asset to a professional CAD or graphics workstation; the following reviews reveal a wide spectrum of capabilities.

Acecad Inc.

Acecad D9000+

BY WILL SCHLETER

The Acecad D9000+ stands out as an easy-to-use and very complete solution to your digitizer needs. This 12- by 12-inch tablet retails for \$359 but can be purchased via mail order for less than \$250, placing it among the lowest-priced units here. It comes configured with a 2-button stylus; a 4-button cursor; solid AutoCAD, Microsoft Windows, and mouse drivers; and many extras, such as AutoCAD templates and dual transducer ports.

No other digitizer here lets you have a tethered cursor and stylus connected and active at the same time; the D9000+'s dual transducer ports let it handle both with ease. The 2-button stylus is sturdy and functional, and the 4-button cursor has solid well-placed buttons but suffers from crosshairs that cast distracting shadows. The \$59.95 3-button inking stylus, with its flimsy construction and awkward side buttons, is an option to avoid. The \$129.95 16-button cursor was unavailable for testing but is now shipping.

Setup is accomplished by way of a setup template, which uses the status light on the tablet to indicate the active settings as the cursor passes over the various setup choices. (In normal tablet operations, the status light depicts cursor proximity.) Tablet emulations provided by the D9000+ include Summagraphics MM and Bit Pad One, and Calcomp 2000; you also get Microsoft Mouse and Mouse Systems mouse emulations. Up to five configurations can be stored in the tablet's keypad for instant retrieval; switching emulations is as easy as pressing a button.

The D9000+'s new mouse driver (Atabket), as well as its Windows and AutoCAD drivers, can drive the tablet in its native mode (Summagraphics MM); this makes moving among Windows, DOS, and AutoCAD transparent. And

nice extras, such as user-controlled button mappings, the ability to use absolute or relative movement, and the ability to adjust the active area to whatever size you'd like, add up to a mouse emulator that is better than the real thing.

The D9000+ Windows driver includes a tablet control panel for Windows that lets you view information about the current configuration, switch transducers (pen or cursor), define button assignments, set the active tablet area, choose relative or absolute mode, and set the

cursor sensitivity for relative mode. Its best feature is its ability to assign double clicks to the extra buttons on the 4-button cursor: A click of the alternate button lets you open and close windows with ease.

The D9000+

feels right at home running AutoCAD. Templates and menu files, as well as a real-mode driver and a new protected-mode ADI (AutoCAD device interface) driver, give you full flexibility. For other DOS applications, you'll have to rely on mouse emulation to get the cursor to register. Better-than-average documentation and the ability to tilt the tablet to



► FACT FILE

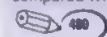
Acecad D9000+

*Acecad Inc., P.O. Box 431, Monterey, CA
93942-0431; 800-676-4223, 408-655-1900;
fax, 408-655-1919*

List price: \$359 with 12- by 12-inch tablet, 2-button stylus, 4-button cursor, cables, AutoCAD overlays, drivers, pen holder, dust cover. 16-button cursor, \$129.95. 3-button inking stylus, \$59.95

Requires: Serial port.

In short: The easy-to-use Acecad D9000+ stands out as a very complete solution to your digitizer needs. A feature-rich set of drivers makes it more than just a CAD tool. At \$250 through mail-order outlets, this unit is also one of the lowest-cost options here. The D9000+'s main drawback was its accuracy score (0.05 inch), which showed a relative lack of precision when compared with the scores of its competitors.



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3.5 or 6 degrees round out the package.

As with most of the units here, the D9000+ claims a 0.01-inch accuracy. On our tests, however, it delivered only a 0.05-inch accuracy.

Other members of the Acecad family include the predecessor to the D9000+, the 12- by 12-inch Acecad D9000 (\$279), and the 12- by 18-inch Acecad D8000 (\$559). The D8000 is identical in functionality to the D9000+, while the D9000 lacks the configuration memory, a second transducer port, and a power switch. The company, however, is best known for its 5- by 5-inch Acecat Graphics Tablet (\$129). This small device gives you the ability to move away from the desktop and operate from palm or lap.

Flawed mainly by its less-than-sterling accuracy, the D9000+ is nevertheless hard to beat as an all-around package. It feels right at home as a CAD digitizer or mouse replacement. It's an affordable, solid package with just enough extras to move it past the realm of the ordinary.

CalComp Inc.

CalComp DrawingBoard II

BY EVAN YARES

The 12- by 12-inch CalComp DrawingBoard II is distinguished by a wide range of input options, including a cordless pressure-sensitive stylus. With any cordless cursor or stylus, the tablet lists at \$645; the price drops to \$495 if you opt for a corded cursor or stylus. Street prices range from as low as \$500 and \$375, respectively.

CalComp makes no less than ten different cursors and styli (optionally inking) for the CalComp DrawingBoard II. There are tethered and cordless versions of a 16-button cursor, as well as two different 4-button cursors (one with the buttons arranged in a diamond shape and one with the buttons in a row). In addition to the pressure-sensitive cordless stylus, the company offers a cordless stylus with a light-touch tip for drawing and another

with a click tip for menu-picking; all three styli sport two side buttons. There is also a traditional corded click-tip stylus (with one side switch). The cordless cursors and styli can be used interchangeably, but if a corded cursor or stylus is plugged in, it overrides the cordless device. (Additional cursors and styli cost about \$100 to \$200 each.) Remapping switches—so a single press operates as a double-click, for instance—is easy.

The CalComp's cursors all sport the same ergonomic shape. They are very comfortable to use when held like a mouse or even when gripped in a claw-like fashion. Although the rubber buttons lack the sharp tactile feedback of a dome or mechanical switch (common to mice and some cursors), they feel pretty good. The 16-button cursors have enlarged L-shaped number 0 and number 4 keys, making it easier to work the cursor as a mouse. These buttons tend to have some rock and are not as positive as the other keys. The cursors use medium-weight crosshairs, which have little or no parallax. If the digitizer were accurate to 0.005 inch instead of 0.01 inch, these would need to be a bit finer. But they were good enough for the unit to digitize within 0.008 inch during testing.

The CalComp's cordless pressure-sensitive stylus is relatively compact and well balanced, despite its use of batteries. The stylus can sense up to 256 levels of pressure through its tip switch, though the drivers support only 128 levels. This stylus is unique among the pressure-

sensitive styli we tested in that it can sense and output the angle and direction at which it is being held. This feature is useful when producing calligraphic effects, for instance; as with a pen or brush, the angle at which you

hold the stylus influences the drawing. The next version of Fractal Design Painter should make use of this feature.

The CalComp comes with excellent Microsoft Windows, AutoCAD real-mode, and AutoCAD protected-mode drivers, but the tablet doesn't offer driv-

PC
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FACT FILE

CalComp DrawingBoard II
*CalComp Inc., 14555 N. 82nd St.,
Scottsdale, AZ 85260-2599; 800-458-5888,
602-948-6540; fax, 602-948-5508*

List price: \$645 with 12- by 12-inch tablet, cordless cursor or stylus, drivers, cables, \$495, corded version
Additional 4-button (in-line pattern or diamond pattern) cordless cursor, \$150, 16-button tethered cursor, \$150, 4-button (in-line or diamond) tethered cursor, \$100, 3-button (pressure-sensitive) cordless stylus, \$200, 3-button cordless stylus, \$150; 3-button (light-touch system) cordless stylus, \$150; 2-button tethered stylus, \$100, stylus inking pack, \$25

Requires: Serial port.

In short: With full-featured setup software and drivers, as well as a vast range of cordless and tethered cursor and stylus options, the CalComp DrawingBoard II is an easy-to-configure and easy-to-use choice.

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The CalComp DrawingBoard II

ers for any other program. During testing, the tablet switched from AutoCAD to mouse emulation and back with no problems. It was generally able to switch modes from program to program without confusion and without having to be reset.

DBM Tablet Manager, the CalComp's full-featured software, is a TSR that allows tablet configuration and macro recording under DOS. You can use the DBM program for setting digitizer emulation and communications parameters, or you can use the menu keys on the tablet. CalComp supplies a similar tablet manager program that runs under Windows. Neither of these programs is actually required; the basic digitizer drivers are separate programs that operate reliably and without fanfare. The tablet can be tilted to 3 and 6 degrees.

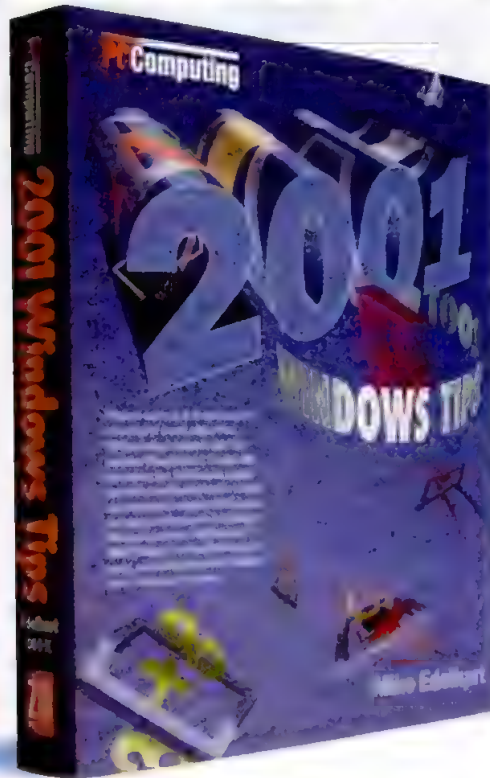
The CalComp is close to a do-everything digitizer. It has almost every type of cursor or stylus you could want and comes in sizes of up to 44 by 60 inches.

GTCO Corp.
GTCO Ultima

BY EVAN YARES

Despite its name, the GTCO Ultima is a relatively simple 12- by 18-inch digitizer: It doesn't use electromagnetic sens-

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ISBN: 1-56276-084-X
Price: \$27.95

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HARDWARE

Digitizing Tablets

ing, does without its own power supply, and offers minimalist drivers. But at \$595, and about \$450 on the street, it is well priced to compete with the slightly smaller 12- by 12-inch tablets that are reviewed in this roundup.

The price includes a 16-button cursor that is rather flat and squarish. The cursor's keys are large, with a concave surface and a light tactile touch.

They are comfortable to use, as long as you don't have to reach for the bottom row too often: With only a little of the cursor body extending below that row, selecting buttons requires serious finger contortions. The cursor uses a clear sensing area, which is devoid of the common wire coil used in electromagnetic digitizers; this offers users an unobstructed view (through the crosshairs) of anything on the tablet surface.

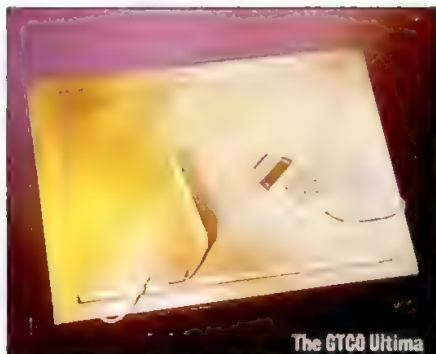
The Ultima offers an optional 4-button cursor as well. This is the same size as the 16-button cursor but has four color-coded buttons arranged in a diamond pattern; this arrangement is easier

to use than the 16-button grouping.

GTCO Corp. makes an inking stylus and a noninking stylus for the Ultima. Both use two switches, one each on the tip and barrel. When used with mouse emulation, the tip switch is mapped to the left mouse button, and the barrel switch to the right mouse button. The styli are good enough for occasional drawing or sketching.

The GTCO Ultima uses power that it drains parasitically from the serial port. The tablet lacks buzzers or programmable keys, and it does not support menus, macro recording, or cordless input options.

The Ultima uses electrostatic rather than electromagnetic sensing. This can lower cost, but it can also make units that rely on this technology more susceptible to outside interference. Putting your hand near or over the crosshairs, for instance, shifts the digitizer's output. During accuracy testing, the Ultima tested no closer than 0.017 inch—not quite the 0.010 inch claimed by the company but



■ What's in a Pen (Computer)?

by Rock Miller

Pen computers may have the flash of the new and nifty, but technologically they are easy to understand as a cross between a laptop and a digitizing tablet. Workable digitizer technology is essential if practical "electronic notebooks" are to be built. The concept not only relies on the digitizer's natural pen-like instrument, but it also demands the digitizer's absolute coordinate space. Whereas a digitizer tablet's aim is to get the working surface off the screen, a pen computer's aim is to make the screen itself a working surface. Digitizer tablets let your system read the *location* of points very precisely. But with a pen PC, the direction and intensity of the strokes are what matter most since these form the basis

of the "gestures" that pen-computer operating systems interpret to control software and recognize handwriting.

Making a digitizer work in a portable-pen environment thus requires a few changes. For instance, conventional electromagnetic tablets are based on a grid of wires. If this type of digitizer is to be used in pen computing, the grid must go beneath the LCD so that the wires won't obscure the screen. But this requires magnetic shielding and a hard glass surface, adding weight and expense.

One early pen PC, the GRiDPAD, relied on an adaptation of touch screens' "direct contact" resistive film technology. The GRiDPAD's glass writing surface has a resistive coating, which generates voltage gradients that

► FACT FILE

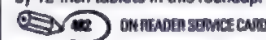
GTCO Ultima

GTCO Corp., 7125 Riverwood Dr.,
Columbia MD 21046;
800-344-4723, 410-381-6688;
fax, 410-290-9065

List price: \$599 with 12- by 18-inch tablet, 16-button cursor, drivers, templates, cables. Additional 4-button cursor, \$99; 2-button stylus, \$99; 2-button inking stylus, \$269.

Requires: Serial port.

In short: A simpler choice in the world of digitizing tablets, the GTCO Ultima doesn't offer enhanced drivers, and it relies on electrostatic sensing (a technique that can make a unit more sensitive to common outside interference). One plus for users who need the extra workspace that this 12- by 18-inch tablet provides: It is priced favorably in comparison with most of the 12- by 12-inch tablets in this roundup.



still better than some electromagnetic devices we saw.

The tablet is sleek and flat, with a clear plastic overlay recessed into the top surface. The tablet's inclination is adjustable from 5 to 9 degrees. The unit emulates Summagraphics MM, and setup is taken care of automatically via software.

can be used to detect the position of the stylus. Such a screen is simple to fabricate, but the current doesn't flow unless the stylus touches the surface. Regular use will eventually wear down the coating. This method translates handwriting adequately, but it's less suitable for both cursor control and pen operating systems' midair gestures.

A better technology, patented by Scriptel Corp., places the resistive coating under a thin glass writing surface. The stylus detects the voltage magnitude by means of capacitive coupling: Its location can be detected even if it does not touch the resistive surface. The coating is not exposed to wear, and the stylus is detected without contacting the surface, so it works well for gesturing and sketching. □

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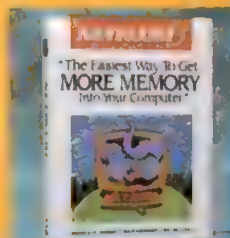
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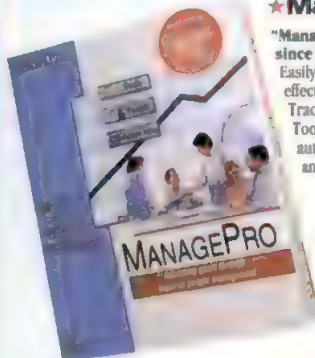
PC Magazine "Editors' Choice" 1992. Close-Up remote communications software lets you take control of PCs miles away by modem as if you were there. Run Windows & DOS applications at record speeds. Work from the road via laptop, transfer files & access networks. **Publisher: Norton-Lambert CM0503/5**



\$119

★ManagePro 1.2 for Windows

"ManagePro may be the single most important software package written for managers since the advent of the PC."—*Info World 3/1/93*
Easily become an even more successful manager. Achieve your goals and manage your people more effectively with three powerful integrated tools. Plan, track and delegate goals with Goal Tools. Track progress, plan coaching and conduct reviews with People Tools. Take action with Action Tools such as calendars. Enter information in simple spreadsheet-style planners. ManagePro then automatically creates: color coded goal and people status boards, timelines, action lists, calendars and reports. **Publisher: Avantos BS7513/5**



"Top Product of '92" PC Week Labs.
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The UnMouse

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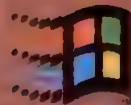
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BS7593	★AUTOMAP for Windows	59
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GR1994	★After Dark 2.0 for Windows	29
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B-1114/5	★C++ Windows	105
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GP-1144	★OmniPage Professional 2.1	549

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Also available: **XTree Gold 2.5 for DOS** UT1874 \$99.95

Publisher: XTree
UT3323/5

\$69.95

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Canon		
PR1500/10	Bubble Jet BJ-10ex (White/Gray)	259
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Manufacturer:
Server Technology
CM0590

\$119

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Typecase II is a versatile library of over 100 TrueType fonts that install seamlessly into Windows 3.1. Typecase TrueType fonts are scalable from 1 to 999 points and are compatible with every Windows supported printer and monitor. This collection of state-of-the-art text, decorative and international symbol fonts is great as an addition to the original Typecase or as a stand alone font library. Also available: Typecase SP0383/5 \$29.95*

Publisher:
SWITE

Typecase II
SP0393/5

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Publisher:
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UT3303

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GR5494	Key CAD Complete	415
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GR2303/5	★Harvard Graphics 3.0	415
GR5063/5	★Harvard Graphics for Windows	369
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UT3094	★Stacker 3.0	109
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UT3463/5	★Norton Desktop 2.2 for Windows	115
UP0973/5	★Norton Desktop 2.0 for Windows	115
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AC1060	The Targus NotePack	109
AC0670	Universal Notebook Case	109
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Publisher: New Vision Technologies, Inc. GR3174

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Digitizing Tablets

The drivers (protected- and real-mode AutoCAD, mouse, and Microsoft Windows) have only the most basic of options, such as scaling and relative, versus absolute, operation. The drivers have no macro-recording or button-remapping capabilities. Still, they work without any tweaking. You will find that the Ultima's mouse emulation is good enough for everyday use, particularly when set for relative mode.

The Ultima comes with a copy of Schaefer Enterprises & Associates' Super Menu Lite software for AutoCAD, Releases 11 and 12. Super Menu Lite includes an AutoCAD menu file and a tablet template that is substantially different from the stock template bundled with AutoCAD. As a result, it may be of limited use to those already using third-party AutoCAD menus.

With an oversize surface, a 16-button cursor, and solid yet basic driver software, the Ultima is an acceptable but not optimal choice. Be cautioned by its susceptibility to outside interference. If you're looking for a smaller unit at a good price, you may want to check out the \$399 12- by 12-inch version of the Ultima, which should be available by the time you read this.

Hitachi America Ltd.

Hitachi Puma Plus

BY WILL SCHLETER

The \$449 Hitachi Puma Plus is a solid product in the digitizer marketplace, marked by a sturdy design and a respectable \$320 street price. The price includes your choice of a 16- or 12-button cursor or the combination of a 4-button cursor and a 2-button stylus. It also includes a set of quality drivers for AutoCAD, Microsoft Windows, and mouse emulation.

The lightweight and well-balanced stylus features a responsive tip switch and an unobtrusive side switch that lies almost flush with the pen's surface. The various cursor selec-

tions all have a crystal-clear, albeit slightly small (0.7 inch), aperture with razor-sharp crosshair markings. The 12- and 16-button cursors will appeal most to CAD users who want the extra capabilities. The tablet is well constructed, and the extra-long (10 foot) cables provided are a pleasant bonus, easing the task of connecting the tablet to the serial port.

Configuring the unit is done by running a general-purpose setup utility, using the setup template, or by running one of the many specific setup utilities provided. The tablet makes good use of audible feedback during the setup process to indicate active settings: It emits two short beeps any time a tablet driver is initialized. The procedure for installing drivers, while functional, has quirks: With the exception of the ADI protected-mode driver, the driver files must be run from the floppy disk drive, and the installation procedure cannot be run if you already have a Puma Plus driver loaded as a TSR.

The Puma Plus supports Summagraphics MM, Bit Pad One, and Microgrid emulations. As with other tablets, once you configure it for one of the Summagraphics emulations, you can also use other CAD packages, such as Cadkey, MicroStation, and VersaCAD, though no specific drivers for these packages are included.

The AutoCAD protected-mode driver provided performed flawlessly during testing. Cursor movement was smooth, even with only a small portion of the tablet mapped to the entire screen. When switched from a DOS program into AutoCAD, the driver was able to reconfigure itself from mouse emulation

for digitizer emulation. Dragging dialog boxes and selecting pull-down menus were equally smooth in AutoCAD. You get a real-mode ADI driver, but no AutoCAD menu overlays are provided.

Both Windows 2.x and 3.x drivers are supplied. An annoying feature of the default configuration of the Windows drivers is that the stylus button mapping has both the tip



FACT FILE

Hitachi Puma Plus

Hitachi America Ltd., 250E Caribbean Dr.,
Sunnyvale, CA 94089; 408-747-0777;
fax, 408-746-2323

List price: \$449 with 12- by 12-inch tablet; 4-button cursor and 2-button stylus, 12-button cursor, or 16-button cursor, power adapter, cables, drivers. Additional 2-button stylus, \$79, 4-button cursor, \$109; 12- or 16-button cursor, \$169

Requires: Serial port.

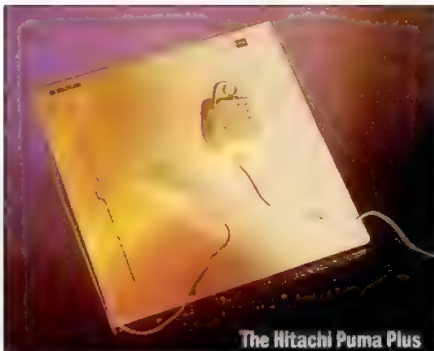
In short: The Hitachi Puma Plus is a well-constructed product with generally good drivers, though they have some installation quirks. Also, the Puma Plus's mouse driver doesn't let you remap cursor or stylus buttons. But even that doesn't detract from the Puma Plus's attractions, which include a 0.002-inch tested accuracy—despite the tablet's 0.02-inch accuracy specification.



switch and side switch mapped to a left mouse button press. To perform a right mouse button press, both switches must be pressed. (A more common configuration is the tip switch as a left mouse button and the side switch as a right mouse button.) The setup utility provides an easy way of changing this mapping, however, as well as an option to limit the active area of the tablet to whatever size you'd like. But the setup utility does not let you configure the stylus or cursor to simulate both mouse buttons being pressed at once (as some CAD programs require).

The Puma Plus supports Microsoft mouse emulation, which uses relative mode. With a variety of applications, the unit had no problems operating as a mouse. Unlike the Windows driver, the mouse driver does not let you remap the cursor or stylus buttons. The 4-button cursor suffers a nonintuitive default mapping of the right mouse button function to the left-most button, though this is not a problem with the other cursors.

Though the Puma Plus's specifications declare a 0.02-inch accuracy—only half as good as most of the tablets here—the tablet deviated only 0.002 inch during testing. Sturdy construction and capable drivers make the Puma Plus a good choice to meet your digitizer needs.



The Hitachi Puma Plus

Digitizing Tablets

Jameco Electronic Components
Computer Products

Jameco KD4000

BY JOSEPH DESPOSITO

Jameco Electronic Components Computer Products, well known for its direct-mail catalog of electronic components and computer products, is offering a digitizer tablet with an attractive price of \$199.95. The Jameco KD4000, manufactured (but not sold directly) by Wintime Corp., comes with a 4-button cursor; power adapter; and standard AutoCAD, Releases 10 and 11, templates. But it does not come with a protected-mode ADI driver. The 11.7- by 11.7-inch Jameco was also the only product here to lack a stylus (though you can buy one from Wintime for \$39.95).

Setting up the Jameco is straightforward. To use the tablet with AutoCAD 12, you run the real-mode ADI driver. The tablet emulates Summagraphics MM right out of the box. You can program the Jameco either with the included setup routine or with commands from the DOS prompt that follow the conventions used by Summagraphics MM tablets.

The Jameco comes with a Microsoft Windows tablet driver (which works in absolute mode) and a mouse driver (which works in relative mode). A configuration program lets you change the active area of the tablet. Besides the AutoCAD and Windows drivers, the Jameco comes with a setup program and setup files to configure the tablet for use with Cadkey, Media Cybernetics' Dr. Halo, Lotus Development Corp.'s Freelance Graphics, and Autodesk Retail Product's Generic CADD. The Jameco also includes a mouse driver for DOS, which can be set to COM1 or COM2 but can't be adjusted otherwise.

During testing, the real-mode ADI driver worked fine with AutoCAD 12, for some operations, but not for others:

You cannot drag a dialog box, for instance. Also, if you exit out to DOS through the AutoCAD Shell command, you cannot regain use of the tablet in digitizer mode when you return. The Jameco does include a driver upgrade that solves this problem, but it is not documented.

When used with Windows drawing packages, such as Micrografx's Picture Publisher and Aldus Corp.'s Aldus FreeHand, the Jameco suffered from its lack of a stylus. Its cursor, though, is comfortable enough to use with CAD programs, sporting four buttons in a square formation. But the cursor aperture is a fairly small 0.7 inch. The crosshairs are not terribly fine, but they are satisfactory.

The Jameco is about an inch thick and easy to handle. You place the included AutoCAD menus for AutoCAD 10 and 11—or your own templates—under a clear overlay. The opaque tablet draws power from an AC/DC adapter and connects to a computer's serial port. A hinged plastic piece underneath the tablet lets you set it at an incline of up to 6 degrees. During accuracy testing, the Jameco performed right about at its 0.01-inch specification.

Anyone who has been scared off by the high cost of digitizing tablets will find the Jameco's price appealing, especially for low-end CAD. But there are tradeoffs in performance and features; for example, the product lacks LEDs to notify you of power-on or proximity status.

If you can spend a little extra money, be aware that you can find products that offer increased performance and better AutoCAD drivers for as low as \$250 on the street. Moreover, you can get those units configured with a stylus right from the vendor.



The Jameco KD4000

FACT FILE

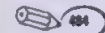
Jameco KD4000

Jameco Electronic Components
Computer Products, 1355 Shoreway
Rd., Belmont, CA 94002;
800-831-4242, 415-592-8097;
fax, 415-592-2503

List price: \$199.95 with 11.7- by 11.7-inch tablet, 4-button cursor, drivers, AutoCAD templates, power adapter, setup software, cables.

Requires: Serial port.

In short: The \$199.95 Jameco KD4000 is a main contender only when cost matters most. It lacks a protected-mode ADI driver, as well as any sort of extras, such as a power-on LED. Also, you'll have to go to another company to buy a stylus. Other digitizing tablets on the market offer better performance at prices that are only slightly higher than that of the Jameco KD4000.



ON READER SERVICE CARD

Kurta Corp.

Kurta XGT

BY EVAN YARES

The Kurta XGT—the premium model from a company long in the digitizer market—can function well in just about any environment, from CAD to graphic design. The 12- by 12-inch version we tested, which included a cordless pressure stylus, retails for \$850. You can substitute a 16-button corded cursor in place of the stylus for the same price. With street prices likely to be closer to \$650, this unit was among the most expensive

we saw. Depending on the complexity of your needs, however, its tremendous flexibility and capabilities may be worth the price.

The Kurta's cordless pressure pen is comfortable to hold and has two good side switches.

It supports 256 levels of pressure (about twice the number now possible from the CalComp DrawingBoard II's stylus). The stylus runs on batteries, but this doesn't

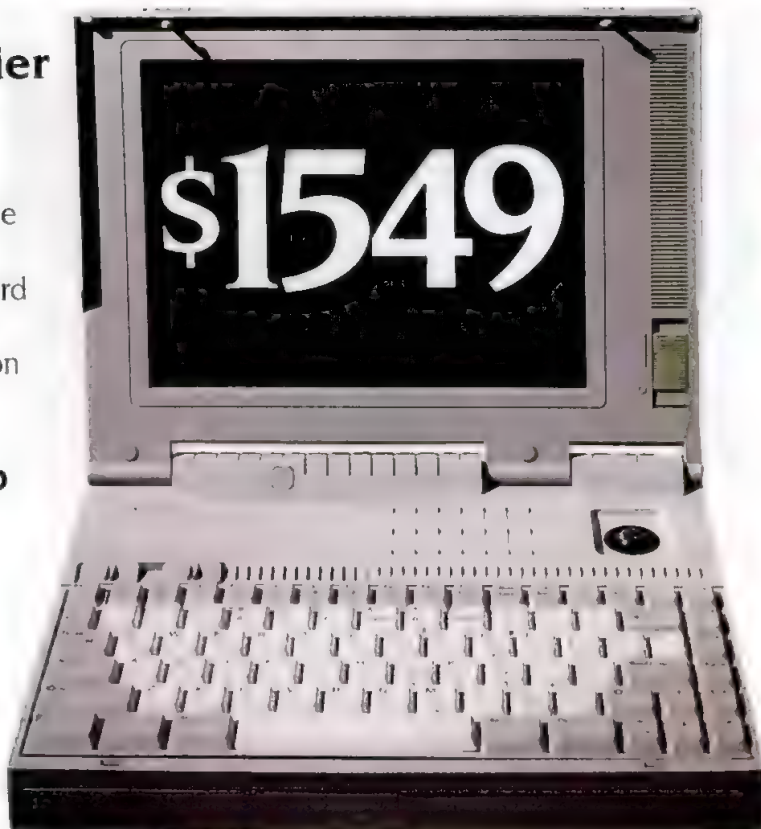


The Kurta XGT

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Digitizing Tablets



FACT FILE

Kurta XGT

Kurta Corp., 3007 E. Chambers St., Phoenix, AZ 85040; 800-445-8782, 602-276-5533; fax, 602-276-7823

List price: \$850 with 12- by 12-inch tablet, 3-button (pressure-sensitive) cordless stylus or 16-button cursor, drivers, configuration template, cables. Additional 16-button cursor, \$200; 3-button (pressure-sensitive) cordless stylus, \$200; 4-button cursor, \$100; 4-button cordless cursor, \$100; 3-button cordless stylus, \$100; magnifier for 16-button cursor, \$100

Requires: Serial port

In short: The Kurta XGT is at home in almost any environment, from CAD to graphic design. It offers a cordless pressure stylus equipped to sense up to 256 levels, emulates almost every major emulation, supports custom macros, and delivers 0.005-inch accuracy. Consider the Kurta if you need more than a basic digitizer.



ON READER SERVICE CARD

affect balance. While the stylus has the brains to detect tilt angle, the Kurta does not offer tilt information in any of its output formats (as the CalComp does). To support pressure sensitivity, you might choose the Wacom format simply because more programs support the Wacom emulation (though you're then limited to 64 pressure levels). The Kurta supports its own pressure format; when using it, the tablet can preset the pressure levels on the stylus using the side switches.

For CAD users, the Kurta's 16-button cursor is a good choice. This full-size corded cursor has enough length in its body so you don't have to contort your hands to press any of the buttons. The buttons have flat hard caps and a good feel, though they provide no real feedback to help determine the position of your fingers. The strength of the 16-button cursor is its oversize 1.5-inch cursor aperture. With its crisp red crosshairs, it is especially apt for critical digitizing. Kurta also makes a \$100 drop-in magnifying lens that fits directly over the crosshairs. The lens is a must-have option, even if you only occasionally digitize drawings. With bright fluorescent lighting, the magnifier makes it easy to pick points within a few thousandths of an inch without eyestrain. On our tests, the

Kurta's 0.005-inch results easily exceeded its 0.01-inch specification.

The Kurta also offers a four-button cordless ergonomic cursor (\$100). It uses double teeter-totter switches (press the front for one switch, the back for the other) arranged in a somewhat mouse-like fashion. But, the body of the cursor is a bit short, and the switches can be difficult to use unless you hold your fingers just so. Also available are a 4-button tethered cursor and a 3-button nonpressure-sensitive stylus (\$100 each).

The Kurta can emulate just about any major brand of digitizer, including Summagraphics MM and Bit Pad One, and CalComp 33000. It also comes with solid mouse and Microsoft Windows drivers, as well as protected- and real-mode AutoCAD, Releases 11 and 12, drivers. With these drivers, the Kurta supports custom macros and scaling.

The Kurta's Pensmith software does double duty by supporting tablet configuration and management of macros. The Kurta can also be configured from a menu strip at the top of the tablet, rather than from software. You can place an included configuration template on its surface and pick the proper boxes to set the emulation from there. Using this method, you will find at least 46 emulation options, not counting variations in data rate, resolution, format modifiers, and communications parameters.

The tablet holds an internal power supply, bringing thickness to 3.1 inches. It can be tilted up to 8 degrees. Kurta also makes the 12- by 18-inch Kurta XLP (\$795), the 42- by 60-inch Kurta XLC (\$2,995), and the 8.5- by 11-inch Kurta IS/ONE (\$525).

The Kurta is at home in many environments. Its breadth of capabilities is welcome and, if you need more than a basic digitizer, may justify its price.

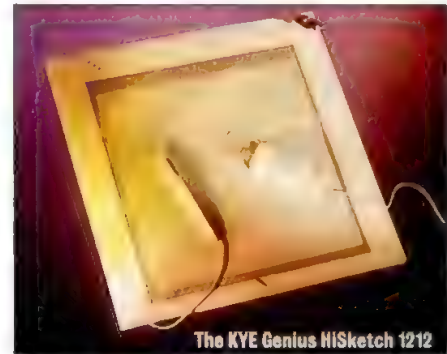
KYE International Corp.

KYE Genius HiSketch 1212

BY WILL SCHLETER

The \$429 KYE Genius HiSketch 1212, from KYE International Corp., is a dinosaur among digitizers. In almost every mode of operation, it lags behind its peers in functionality and flexibility. It costs

less than \$250 on the street and includes a 4-button cursor, a 2-button stylus, and AutoCAD templates. You also get the DOS version of Autodesk's AutoSketch 2.0 and Microsoft Windows for Pen Computing Extensions, Version 1.0 (though



The KYE Genius HiSketch 1212

the latter may be better paired with a smaller tablet).

The cord from the transformer plugs into the serial-port connector, which also attaches to the tablet. Power and reset switches are located at the rear, along with a 9-pin serial port, a single connector for a cursor or stylus, and four hard-to-reach DIP switches, which let you select digitizer or mouse mode, Microsoft or Mouse Systems mouse emulation, parity, and baud rate. The Genius HiSketch 1212's software setup loads your drivers without letting you switch among modes. Three status lights indicate power, prox-

FACT FILE

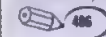
KYE Genius HiSketch 1212

KYE International Corp.,
2605 E. Cedar St., Ontario, CA
91761-8511; 800-456-7593; 909-923-3510;
fax, 909-923-1469

List price: \$429 with 12- by 12-inch tablet; 2-button inking stylus and 4-button cursor; power adapter; AutoCAD templates; AutoSketch 2.0; Microsoft Windows for Pen Computing Extensions; cables; drivers. Extra inking cartridges, five for \$5.

Requires: Serial port, DOS 3.0 or above.

In short: The KYE Genius HiSketch 1212 functions adequately as a single-purpose digitizer but struggled when put to our tests. It is out of date compared with much of the competition, lacking a protected-mode ADI driver, and its inability to switch easily between tablet and mouse modes means it won't be the sole input device on your desk.



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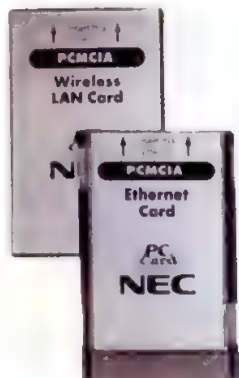
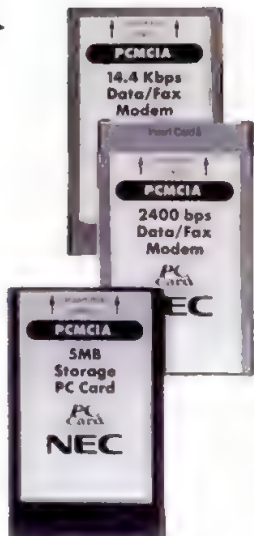
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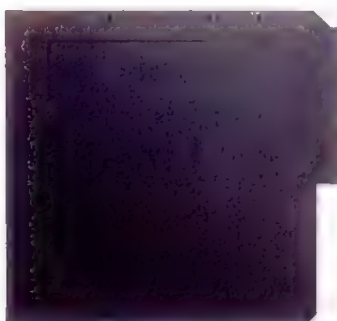
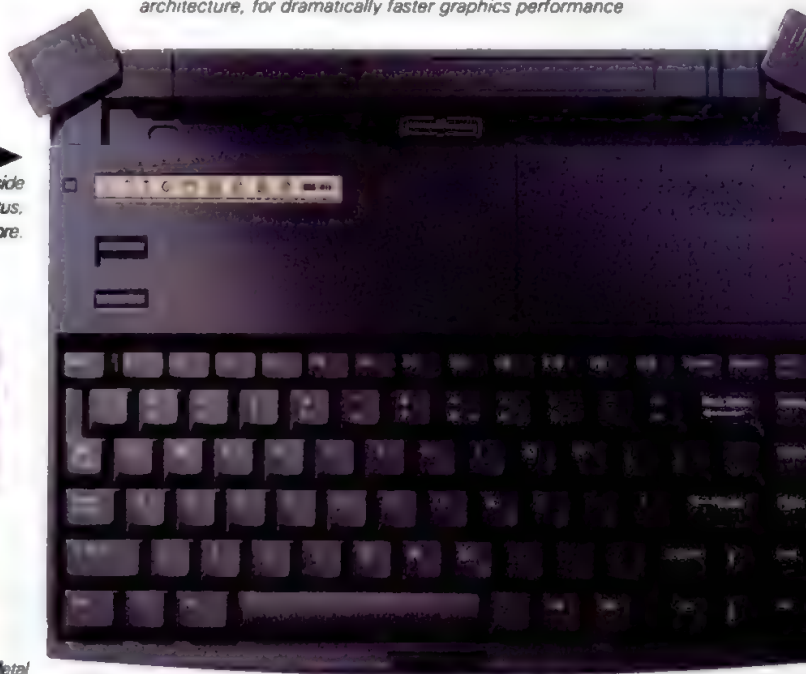
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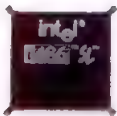
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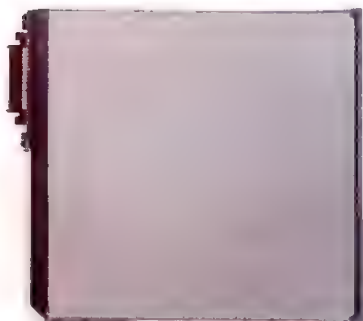
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Digitizing Tablets

imity, and status (button presses).

A recessed overlay area and a hard, plastic overlay cover mean that your cursor never gets caught on the side of the overlay as you slide it around. The tablet can tilt to 3.5 degrees. The 4-button cursor is an elongated slimline shape with rounded edges. Unlike most cursors, whose buttons are labeled or color coded to make documenting specific features simple, it has large, plain buttons. The cursor crosshairs are relatively wide and do not lie completely flat on the tablet, thus casting annoying shadows. The tablet delivered a 0.028-inch tested accuracy instead of its claimed 0.01-inch specification.

On a positive note, the large, clear plastic extension of the cursor containing the crosshairs can be angled up to 45 degrees in either direction, giving you some flexibility. The 2-button stylus is comfortable and functional (an inkable cartridge refill is available).

The tablet supports AutoCAD with a real-mode ADI (Version 1.6) driver (which requires 14K as a TSR) and releases 10 and 11 menu templates. While the ADI driver functions acceptably, it lacks some features found in more recent versions of the ADI specification (now at Version 4.2), such as the ability to drag windows or reconfigure itself when reentering AutoCAD from DOS. Since the tablet's native mode emulates a Summagraphics MM tablet, we tried using AutoCAD's version of the protected-mode MM driver, but it worked irregularly.

Using the tablet with Windows works fine with the tablet still in digitizer mode, as long as you don't run DOS-based applications that require a mouse. If you do flip the DIP switch to change to mouse mode while in a DOS session under Windows, your Windows screen cursor will freeze until you restart Windows. The default button mapping that uses the extra buttons on the 4-button cursor to execute double clicks is a great feature, however. There is no utility to change settings such as button mappings or active area.

With the 4-button cursor, the supplied mouse driver works fine for DOS applications not under Windows. When using the 2-button stylus, however, you don't get a right mouse button: The side switch on the stylus maps as the left mouse but-

ton and the tip switch as the middle mouse button. There is no way to reset the mappings.

If you're never planning to switch applications, the HiSketch 1212 could work as a single-purpose 12- by 12-inch digitizer. But it struggles when put to the test with a variety of applications. A few nice features make up for neither its out-of-date drivers nor for having to toggle DIP switches to switch modes.

Numonics Corp.

Numonics GraphicMaster II

BY WILL SCHLETER

The \$595 Numonics GraphicMaster II is an easy-to-use, no-frills 12- by 12-inch digitizer. Configured with either a 4-button cursor and a 2-button stylus or a 16-button cursor, this unit sells for about \$360 on the street. The AutoCAD and Windows drivers are slightly out of date (updates are in the works), but softkeys let you store customized setup configurations and make switching among emulations a breeze.

The tablet weighs a mere 2.3 pounds and lacks a power supply. The serial-port connection supplies the necessary power as long as the port conforms to RS-232C specifications. For those computers (such as some laptops) with an inadequate port, an auxiliary power supply is a necessary



option (\$60). The company claims a resolution of up to 5,000 lines per inch, though no applications currently take advantage of this. The unit's 0.01-inch accuracy specification matched its results on our accuracy test. A set of removable feet lets the tablet tilt to 2, 11, and 16.5 degrees.

The 4- and 16-button cursors have larger-than-normal apertures with clear and distinct crosshair markings. The small size of the 4-button cursor may prove uncomfortable for a person with large hands. While the 4-button cursor has a felt bottom to prevent it from sliding off an inclined tablet, the 16-button cursor lacks this feature. The stylus is lightweight and comfortable, but the rubber-covered side switch is mushy.

The tablet improves upon the original GraphicMaster by adding six one-touch softkeys, audible feedback during setup, and an AutoCAD ADI driver. The softkeys let you store customized setup configurations and switch among various emulation modes with a single tablet pick. The softkeys are programmed using a setup template to specify the various settings. To identify current settings, the tablet beeps when the cursor crosses an overlay area with a setting that is active.

During testing, AutoCAD support was good with a few exceptions. The real-mode ADI driver (Version 4.1) did not support dragging, and the tablet had to be reinitialized upon return to AutoCAD after shelling out to DOS. But using the cursor for drawing in AutoCAD was smooth and without delay, even with a small portion of the tablet mapped to the entire display. An ADI protected-mode driver (Version 4.2) should be available by the time you read this. Until then, you can avoid such problems by setting the tablet to emulate a Summagraphics MM tablet and using the protected-mode

FACT FILE

Numonics GraphicMaster II

*Numonics Corp., 101 Commerce Dr.,
Montgomeryville, PA 18936; 800-523-6716,
215-362-2766; fax, 215-361-0167*

List price: \$595 with 12- by 12-inch tablet, 4-button cursor and 2-button stylus or 16-button cursor, cables, and drivers. Additional 2-button stylus, \$75; 4-button cursor, \$105; 16-button cursor, \$205; DB9 to DB25 adapter, \$12; auxiliary power supply, \$60

Requires: RS-232C-compliant serial port.

In short: Outdated drivers detract from the Numonics GraphicMaster II's appeal, though new drivers should be available by the time you read this. Using the softkeys to switch between emulation modes with a single tablet pick will come in handy if you routinely work among several applications.



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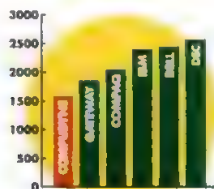


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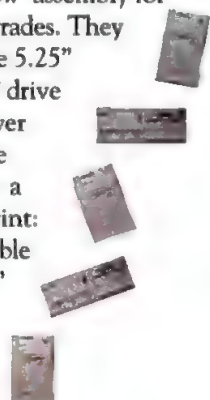
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486SX/33"	8K CPU cache/ 4 MB	170	16 bit SVGA card/ 14" 1024 x 768 SVGA color monitor		\$1199 \$44/mo.*
486DX/33 Cache	128K CPU cache/ 4 MB	245	<i>All these systems come with:</i> 16 bit True Color SVGA Windows accelerator card with 1 MB RAM/ 14" 1024 x 768 SVGA .28 dot pitch non-interlaced color monitor		\$1599 \$59/mo.*
486DX2/50 Cache	128K CPU cache/ 4 MB	245			\$1799 \$67/mo.*
486DX2/66 Cache	128K CPU cache/ 4 MB	245			\$1999 \$74/mo.*
486DX/50 Cache	128K CPU cache/ 8 MB	340			\$2299 \$85/mo.*

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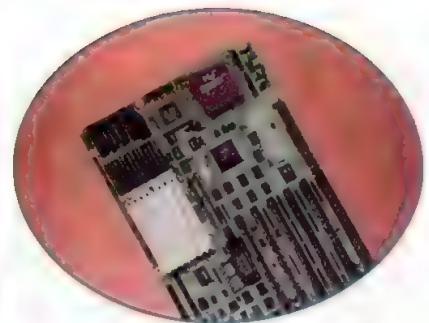
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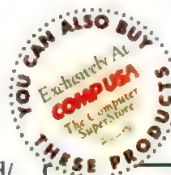
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HARDWARE

Digitizing Tablets

► SUMMARY OF FEATURES

Digitizing Tablets

Products listed in alphabetical order

■ = YES □ = NO

Acecad D9000+

PC EDITOR'S CHOICE
CalComp
DrawingBoard
II

GTCO Ultima

PC EDITOR'S CHOICE
Hitachi Puma
Plus

Jameco KD4000

PC EDITOR'S CHOICE
Kurta XGT

General Features

List price	\$359	\$645	\$599	\$449	\$199.95	\$850
Physical dimensions (HWD, inches)	1.5 x 15.6 x 16	1.7 x 14.6 x 15.9	1.5 x 21 x 15	1.2 x 16.2 x 15.8	1.0 x 16.3 x 16	3.1 x 16.4 x 17.3
Workspace area (HW, inches)	12 x 12	12 x 12	12 x 18	12 x 12	11.7 x 11.7	12 x 12
Weight (pounds)	4.0	4.1	2.8	5.5	4.4	6.5
Inclination angle	0°, 3.5°, 6°	0°, 3°, 6°	0°, 5°, 9°	0°, 5.5°	0° to 6°	0°, 8°
Technology	Electromagnetic	Electromagnetic	Electrostatic	Electromagnetic	Electromagnetic	Electromagnetic
Rated accuracy (inches)	0.01	0.01	0.01	0.02	0.01	0.01
Maximum rated resolution (lines per inch)	1,016	2,450	1,000	1,016	1,016	2,540
Opaque or transparent	Opaque	Opaque	Opaque	Opaque	Opaque	Opaque
Mouse emulation	■	■	■	■	■	■

Input Devices

4-button cursor	■	■	■	■	■	■
16-button cursor	■	■	■	■	□	■
Cursor proximity (inches)	0.4	1	0.5	0.2	0.5	0.8 or 1 *
Inking/noninking stylus	■ ■	■ ■	■ ■	□ ■	N/A	■ ■
Stylus proximity (inches)	0.3	0.4 or 0.7 *	0.3	0.2	N/A	0.5
Supports pressure-sensitive input devices	□	■	□	□	□	■
Maximum reading speed (points per second):						
Stylus	150	200	120	185	N/A	178
Cursor	150	200	120	185	200	178

Emulations

Summagraphics MM	■	■	■	■	■	■
Summagraphics Bit Pad series	■	□	□	■	□	■
Summagraphics Microgrid	□	■	□	■	□	□
GTCO Digipad	□	■	□	□	□	□
CalComp 2000	■	■	□	□	□	□
Kurta IS/ONE	□	■	□	□	□	■

Miscellaneous

Power drawn from serial port or power supply	Power supply	Power supply	Serial port	Power supply	Power supply	Power supply
Internal or external power supply	External	External	N/A	External	External	Internal
Maximum thickness of objects (inches)	0.3	1	0.5	0.2	0.5	1
LEDs (light-emitting diodes):						
Power-on LED	■	■	■	□	□	■
Proximity LED	■	■	□	□	□	■

Customer Service and Support

Toll-free technical support	□	■	■	□	■	■
BBS	■	■	□	□	■	■
Tech-support hours (EST)	11:00–8:00 M–F	10:30–7:30 M–F	8:30–6:00 M–F	12:00–8:00 M–F	10:00–7:00 M–F	8:00–8:00 M–F
Warranty	3 years	Lifetime	Lifetime	10 years	1 year	Lifetime
Parts and labor	■	■	■	■	Parts only	■

N/A—Not applicable: The product does not have this feature

* Depending on transducer option

HARDWARE

Digitizing Tablets

KYE Genius HiSketch 1212	Numonics Graphic-Master II	Scriptel RDT-1212	Summagraphics SummaSketch III	Wacom SD-421E
\$429	\$595	\$1,347	\$599	\$1,195
1.75 x 16.25 x 16.25	0.9 x 15 x 15	1.5 x 19.7 x 16.6	1.5 x 16.3 x 16.3	2.7 x 20.8 x 20.7
12 x 12	12 x 12	12 x 12	12 x 12	12 x 12
4.8	2.3	6.7	5.3	12.2
0°, 3.5°	0°, 2°, 11°, 16.5°	0°	0°, 3.2° to 7°	0°, 6°
Electromagnetic	Electromagnetic	Noncontact electrostatic	Electromagnetic	Electromagnetic resonance
0.01	0.01	0.01	0.01	0.006
1,061	5,000	1,000	2,540	1,270
Opaque	Opaque	Transparent	Opaque	Opaque
☒	☒	☒	☒	☒
☒	☒	☒	☒	☒
☐	☒	☐	☒	☐
0.8	0.4	0.3	0.5	0.3
☒	☐	☐	☒	☒
0.6	0.4	0.3	0.5	0.2
☐	☐	☐	☐	☒
90	160	200	114	205
90	160	200	114	205
☒	☒	☒	☒	☒
☒	☒	☒	☐	☒
☐	☐	☐	☒	☐
☒	☐	☒	☐	☐
☒	☐	☐	☐	☐
☐	☐	☐	☐	☐
Power supply	Serial port	Power supply	Power supply	Power supply
External	N/A	External	External	Internal
0.5	0.4	0.3	0.5	0.2
☒	☐	☐	☒	☒
☒	☐	☐	☒	☒
☐	☐	☐	☒	☒
☒	☒	☐	☒	☒
11:00-8:00 M-F	7:30-6:00 M-F	7:30-4:00 M-F	8:30-5:00 M-F	12:00-8:00 M-F
3 years	Lifetime	1 year	Lifetime	1 year
☒	☒	☒	☒	☒

driver that is supplied with AutoCAD.

The tablet supports Microsoft Windows, Versions 3.0 and 3.1, with a supplied driver and setup program. The setup program lets you specify tablet size, communications port, and screen mapping. The driver, like its AutoCAD counterpart, is not without problems. When you double-click on an icon with the stylus, the icon usually moves slightly between the two clicks. Applications that require a simultaneous right and left button click are accommodated by pressing and holding the left button while the right button is pressed. An updated Windows driver (and mouse driver) should be available by the time you read this.

Mouse emulation is provided either by using the supplied mouse driver and the tablet's native mode or by setting the tablet to Microsoft mouse mode and using a Microsoft mouse driver. Both methods worked equally well in all applications tested. The only notable difference between the tablet and a real mouse was that the tablet detects cursor or stylus motion up to 3/8 of an inch away.

The GraphicMaster II's softkeys, for easy emulation switching, are a plus, and this tablet provides all of the basic functionality you'll need. New drivers will help make it an even better solution for your digitizing needs.

Scriptel Corp.

Scriptel RDT-1212

BY JOSEPH DESPOSITO

Among the digitizers tested here, the Scriptel RDT-1212 is unique for its transparent, noncontacting electrostatic properties and its high price tag of \$1,347. Unless you need this tablet's special capabilities—transparency and programming flexibility—you will probably want to pass.

The RDT-1212 comes with a 4-button cursor; an external power supply; a disk-based AutoCAD, Release 12, driver; an LCD; and built-in drivers. Either a tip-switch or a 2-button barrel-switch stylus can be substituted for the cursor or purchased for an additional \$114 each. The cursor, whose four buttons are aligned in a row, lays flat on the tablet surface. The cursor feels comfortable in the hand, and

Digitizing Tablets

it can be easily moved around the tablet's surface. Of the two styli, the barrel-switch model feels more comfortable; the tip-switch model is thicker and heavier.

The RDT-1212 is a clear piece of glass with a curved plastic attachment at the top edge. There is no overlay to use with templates and no built-in device for tilting the tablet. It draws its power from a separate power supply and connects to the computer's serial port. Although digitizers based on electrostatic technology can be more prone to common interference than electromagnetic units, no such problems appeared during testing. The tablet performed just slightly over its 0.01-inch specification; some of the electromagnetic units we tested were much less accurate. As a transparent unit, the 12- by 12-inch tablet can be mounted on a light box.

Setting up the RDT-1212 should be straightforward—setup is accomplished through firmware and an LCD—but poor documentation made it a chore. Basically, you need to select the driver from the menu on the eight-character LCD. To

use the tablet with AutoCAD 12, however, you need to copy the supplied protected-mode ADI driver to the appropriate directory and then select the Summagraphics Bit Pad One emulation from the menu. Since this is not documented, we had to call tech support for assistance. For Microsoft Windows operation, you need to install the Mouse Systems driver for COM2 in Windows and then select the mouse emulation from the LCD menu. This procedure is also not documented.

Once you become accustomed to the menu system, you can use it to modify any digitizer parameter, such as scaling, format, and data-collection mode. You can also program the tablet remotely from a host computer. Documentation includes the data frame structure of the RDT-1212 and other emulated digitizer formats. It also shows you how to change individual bits of the frame if you should need to.

The RDT-1212 comes with a built-in AutoCAD, Release 11, driver and several emulations: Summagraphics MM, Bit Pad One, and Bit Pad Two; Houston Instrument Hipad; Hitachi Hicomscan; and GTCO Digipad. The protected-mode ADI driver worked fine with AutoCAD 12. The only problem occurred when using the AutoCAD shell command: The built-in mouse driver did not respond when in DOS.

Scriptel, a leader in the pen-based computer market, sells its digitizing tablets both directly and through distributors; discounts to list prices are reportedly available only for quantity and educational purchases. Scriptel also offers larger, transparent, noncontacting electrostatic tablets: the 12- by 18-inch Scriptel RDT-1218 (\$1,554) and the 24- by 36-inch Scriptel RDT-2436 (\$4,362).

Spending more than \$1,300 on a tablet this size is hard to justify, especially for common CAD and drawing applications. But if you need its transparency feature or programming flexibility, you may find the extra cost worthwhile.



The Scriptel RDT-1212

Summagraphics Corp.

Summagraphics SummaSketch III

BY JOSEPH DESPOSITO

Summagraphics Corp., a name synonymous with digitizing tablets, has made several improvements to its latest product, which it has managed to keep competitively priced. Compared with its predecessor, the Summagraphics SummaSketch II Plus, the \$599 Summagraphics SummaSketch III has a larger active area (12 by 12 inches rather than 11.7 by 11.7 inches), greater resolution (up to 2,540 lines per inch versus 1,000 lines per inch), and better ergonomics. With a street price around \$300, the SummaSketch III is not that far from some of the least-costly digitizers here.

You can opt for a 4-button cursor and 2-button stylus or a 16-button cursor, and you can request a free AutoMaster template for the AutoCAD version you choose. Each of the cursors and the stylus feel comfortable in the hand, as well as



The Summagraphics SummaSketch III

when you're moving them around the tablet surface. Note that the cursor aperture is a mere 0.5 inch, though the crosshairs are fine and sharp. The stylus has a barrel switch and a tip switch.

The SummaSketch III senses the type of input device attached to it. If the 4-button cursor or the stylus is attached, the tablet defaults to Summagraphics' own MM format; if the 16-button cursor is attached, the tablet operates in Summagraphics' UIOF (Universal Input/Output Format)/Microgrid format. To use the tablet with AutoCAD, Release 12, you may employ the drivers provided by either Summagraphics or Autodesk. The included real- and protected-mode drivers were designed for AutoCAD, Re-

FACT FILE

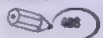
Scriptel RDT-1212

Scriptel Corp., 4145 Arlingate Plaza,
Columbus, OH 43228; 614-276-8402;
fax, 614-276-7615

List price: \$1,347 with 12- by 12-inch tablet, 4-button cursor or 1-button or 2-button stylus, drivers, power supply, cables. Additional 4-button cursor, \$114, additional 1-button or 2-button stylus, \$114; DB-25 to DB-9 adapter, \$45

Requires: Serial port.

In short: The Scriptel RDT-1212 is unique among the digitizing tablets we tested for both its transparent, noncontacting electrostatic properties and its high \$1,347 price tag. If you're planning to stick with simple CAD use, and your applications don't require the transparency and programming flexibility that the Scriptel offers, you will probably be better off looking elsewhere



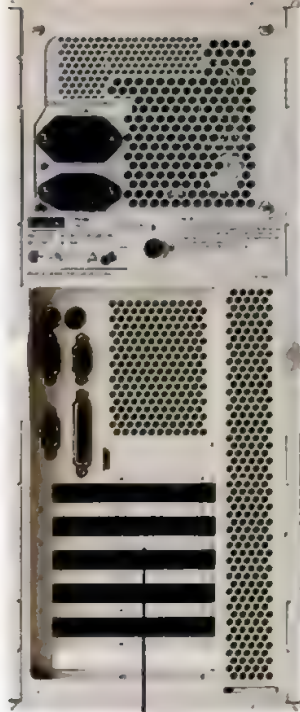
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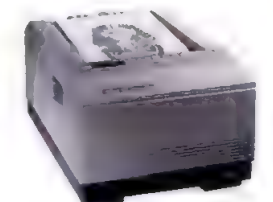
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■ The Artist's Touch

by Luisa Simone

The pen-shaped stylus, especially the cordless variety, gives computer artists something as important as creative freedom: physical freedom. Instead of having to deal with a wire tether and the unnatural grip of a mouse, users will find that a cordless stylus lets them move with a fluidity that matches that of traditional drawing implements such as brushes and pencils.

In addition to tracking the movement of the artist's hand, some digitizing tablets also record the artist's touch. The CalComp DrawingPad and DrawingBoard II, the Kurta XGT, and Wacom Technology Corp.'s SD series all respond to pressure by modulating the electrical signal that is sent from pen to tablet.

The single best measure of a digitizing tablet's ability to handle pressure data is the number of levels it records. The Wacom SD-421E offers 60 levels of sensitivity. The CalComp DrawingBoard II and the Kurta XGT both improve upon that number dramatically with 128 and 256 levels, respectively. (The CalComp can support 256 levels in hardware, but the drivers only support up to 128 levels.)

But hardware capabilities must always be considered within the context of configuration options and software support. All of the tablets allow you to turn the pressure mode on or off. And the ability to set a threshold level where pressure data will start recording can save you from a too-sensitive stylus. Only the Kurta XGT, however, offers firmware settings that let you customize the feel of the pressure-sensitive pen. With the Kurta XGT, you can narrow the pressure range from 256 to 128 or 64 levels, and you can even alter the rate at which pressure increases or decreases.

Pressure data is useless if your application program doesn't know what to do with it. Most graphics programs that

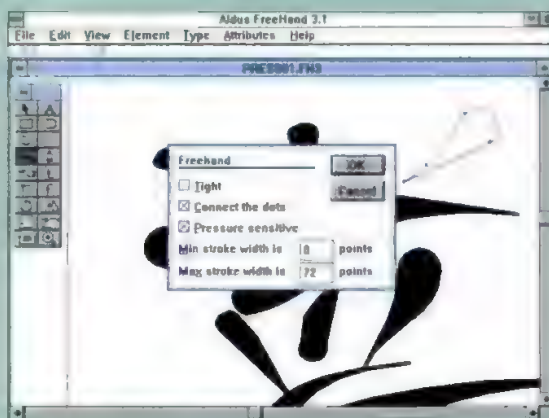
make use of this information are raster-based paint programs, since they can respond to changes in pressure on a pixel-by-pixel basis. Paint programs—such as Fractal Design Painter, Computer Associates International's CA-Cricket Paint, and Time Arts' Lumena—offer the most support and can alter brush-stroke size, airbrush density, and color opacity in response to changing pressure levels.

Other graphics programs demonstrate limited support of pressure sensitivity. Only 2 of Autodesk Animator Pro's 22 painting tools actually respond to pressure changes. And both Micrografx's Picture Publisher and Caere Corp.'s Image Assistant require you to use a Wacom tablet (or Wacom emulation mode) to take advantage of its pressure-sensitive brushes. So if you own a Kurta tablet, but are forced to run it as a Wacom device, you will be able to utilize only 64 sensitivity levels.

But software support of pressure sensitivity is becoming more sophisticated. The soon-to-be-released Adobe PhotoShop for Windows will use pressure data to alter the size, opacity, and even color of its retouching and painting tools. Also, software programmers are discovering new ways to interpret pressure data. Aldus FreeHand (Version 3.1 only) is a vector drawing program that simulates varying line widths via a new pressure-sensitive freehand tool. FreeHand lets you determine a minimum and maximum stroke width, which it incorporates to create free-form shapes that follow the path you draw. There's a lot of complicated math going on, but users will find it feels much like traditional pen and ink.

While current support of pressure

sensitivity may be spotty, products are rapidly converging toward similar functionality and a set of industry-wide standards. Wacom recently announced the ArtZ, which will offer 120 levels of sensitivity and many of the configuration options now found in the Kurta tablets. More important, the sticky issue of compatibility will be resolved by the introduction of PenWindows and WinTab drivers. By building support



Aldus FreeHand for Windows, Version 3.1, interprets pressure data to simulate line widths of varying point sizes. When you use it with the Wacom SD-421E, you can create this calligraphic effect.

for pointing devices into Microsoft Windows, PenWindows makes proprietary drivers irrelevant. The WinTab specification, developed by LCS Telegraphics (617-225-7970), makes the unique features of a tablet accessible. For example, software programs that support the WinTab specification will be able to utilize tilt and height information from the CalComp DrawingBoard II that now goes to waste. Tilt and height can be used to create calligraphic effects and mimic airbrushing techniques, respectively.

Pressure-sensitive devices are an essential tool for electronic artists. With them, the computer is more responsive to the artist's hand, drawings are easier to create, and the finished image contains a powerful emotive element: the master's touch. □

Digitizing Tablets

lease 11, but work with Release 12. (These drivers are currently being updated and should be available by the time you read this.) Also included are mouse drivers and drivers for Microsoft Windows 3.x, each of which can be configured for absolute or relative mode. For DOS, initial mouse-driver parameters can be changed by setting command-line switches for communications ports, cursor or stylus buttons, tracking, and other options. For Windows, Summagraphics provides a control panel for altering default driver parameters, such as tracking mode, cursor or stylus button definitions, and tablet active area size and positioning. (Neither driver lets you map a double-click onto a single button press.)

The tablet exhibits fine performance in AutoCAD 12, though you can't drag a dialog box with the older drivers. The tablet combined with the stylus performed well during testing with Windows drawing products, though the slight pressure needed to keep the stylus tip engaged felt tiring after drawing for a while. During accuracy testing, the device performed up to its 0.01-inch specification.

The tablet's ergonomic improvements include a clear overlay that now sits in a recessed area on the face of the tablet; another recessed area is provided for a template. Adjustable feet let you tilt the

tablet from 3.2 to 7 degrees. The tablet draws power from a supply that plugs into a wall outlet on one end and into the DB-25 connector on the other.

Although the tablet comes ready to run in its default configuration, you can adjust its parameters and test its operation with utility programs included with the package. Optional subtemplates let you add symbols to drawings by pointing at icons. Architectural, mechanical, and electrical symbol-library subtemplates are available for about \$150 each.

Summagraphics also markets the 12-by 18-inch Summagraphics SummaSketch III Professional (\$999) and the 6-by 9-inch Summagraphics SummaSketch (\$449). The SummaSketch III is a quality digitizing tablet with much to offer. AutoCAD users in particular should consider the availability of optional symbol-library subtemplates.

Wacom Technology Corp.

Wacom SD-421E

BY EVAN YARES

Wacom was the first digitizing-tablet manufacturer to offer a cordless pressure stylus; today, Kurta and CalComp compete with their own pressure-sensitive styli. Being the first in the market has its advantages, in terms of compatibility with software packages that support pressure sensitivity, but there are disadvantages as well: Wacom's older technology has been surpassed by the newcomers' in terms of the number of pressure-sensitivity levels supported. Even so, the \$1,195 (near \$800 on the street) Wacom SD-421E remains a strong, albeit pricey,

option for graphics work. The price includes a 4-button cordless cursor and a tip-switch cordless pressure stylus.

There are four styli available. Two of them (\$80 each) are standard non-pressure models, one with a tactile tip switch and one with a nonstroke (light-touch) tip switch. Both have single side



switches. The other two styli support 60 levels of pressure sensitivity (you can purchase either as a second pressure-sensitive device for \$125); one has a firm touch, the other a light touch, and neither have side switches. All input options are cordless, and all but the firm-touch pressure-sensitive stylus are optionally inkable. Unlike the other pressure-sensitive styli in this review, Wacom's styli have no batteries to add weight. Wacom's new line of digitizing tablets (expected this summer) will feature a lone universal stylus with 120 pressure levels and an adjustable tip switch.

The SD-421E's single cursor is a smallish 4-button unit with light tactile keys and crisp crosshairs that cast very little shadow and are fine enough to be used for critical digitizing. The SD-421E supports the accuracy necessary to do this: Wacom rates the tablet at a 0.006-inch accuracy; on our tests, it managed a 0.002-inch accuracy.

At 12.2 pounds, the SD-421E was by far the heaviest of the tablets here; this is mostly due to its internal power supply and high internal-parts count (needed to let the stylus work without batteries). The tablet tilts to 6 degrees. One helpful feature is an electro-

static paper hold-down: Place a sheet of paper on the tablet, flip on the Hold switch, and the paper sticks firmly to the tablet's surface.

The SD-421E lacks a programmable keypad. It also uses DIP switches for the full range of setup options. The setup program adjusts only the tablet's emulation

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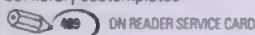
Summagraphics
SummaSketch III

Summagraphics Corp., 60 Silvermine Rd.,
Seymour, CT 06483; 800-729-7866,
203-881-5400; fax, 203-881-5367

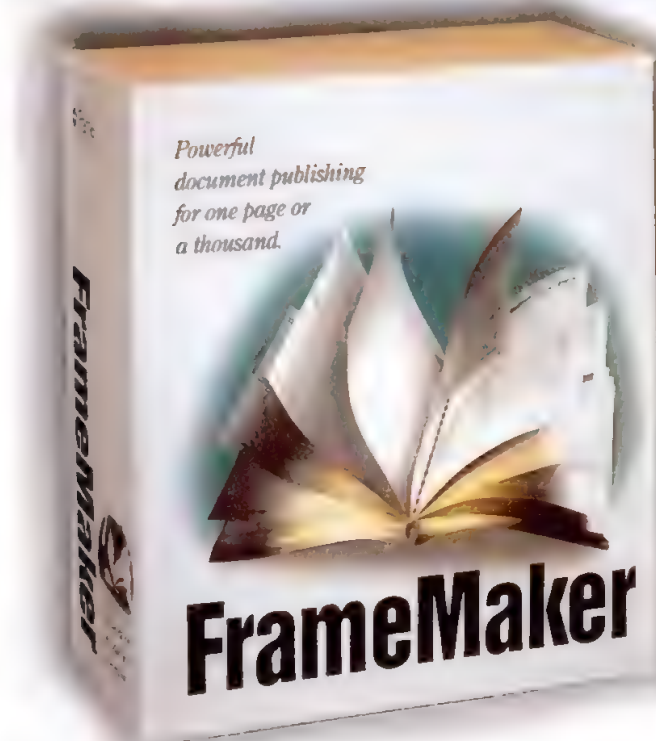
List price: \$599 with 12-by 12-inch tablet, 4-button cursor and 2-button stylus or 16-button cursor, power supply, drivers, AutoMaster template, power supply. Additional 4-button cursor, \$99; 2-button stylus, \$49, 16-button cursor, \$199; stylus refills, \$2; pen refill kit, \$8, Macintosh ADB upgrade kit, \$125; Summagraphics AutoCAD subtemplates, \$99 to \$395

Requires: Serial port.

In short: A quality, competitively priced (\$300 on the street) digitizing tablet with great appeal, the Summagraphics SummaSketch III will be of particular interest to AutoCAD users who can benefit from optional symbol library subtemplates



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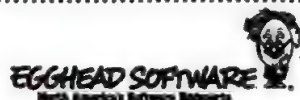
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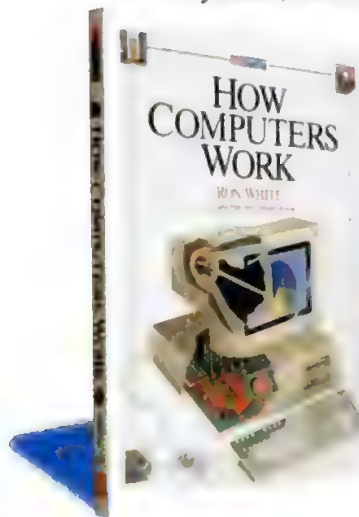
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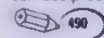
Wacom SD-421E

Wacom Technology Corp., 501 S.E.
Columbia Shores Blvd., #300, Vancouver
WA 98661; 800-922-6613,
206-750-8882; fax, 206-750-8924

List price: \$1,195 with 12- by 12-inch tablet, 4-button cordless cursor, 1-button pressure-sensitive cordless stylus, drivers, and stylus holder. Additional 2-button cordless (nontactile) stylus, \$80, 2-button cordless (tactile) stylus, \$80, 1-button cordless pressure-sensitive stylus, \$125.

Requires: Serial port.

In short: Wacom's solid presence in the cordless pressure-pen market grants the Wacom SD-421E compatibility with most software packages. Too expensive for CAD use only, the tablet is at home with paint programs, photo retouching, and other applications that can use pressure sensitivity.



ON READER SERVICE CARD

(allowing you to change between Wacom and Summagraphics modes, for example). In most cases, the default DIP switch settings are acceptable, though.

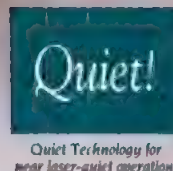
The SD-421E includes very good software, including a mouse driver, protected- and real-mode AutoCAD ADI drivers, and a Microsoft Windows driver. The mouse and AutoCAD, Releases 11 and 12, drivers are only notable in that they work; they have no real whistles or bells. Load the mouse driver, configure AutoCAD to use the protected-mode ADI digitizer driver, and the tablet switches back and forth between the two modes transparently. The SD-421E control panel program for Windows includes a slider bar that varies the pressure sensitivity of the tablet. The SD-421E supports only Summagraphics (nonpressure-sensitive) and Wacom output formats.

The SD-421E's other pressure-sensitive tablets include the 6- by 9-inch Wacom SD-510C (\$795) and the 18- by 25-inch Wacom SD-210L (\$4,095).

The SD-421E remains much too costly for those who live in CAD programs. But it's a good bet for graphic artists who need pressure sensitivity. Even so, you may do better waiting for Wacom's new series of digitizers—due out this summer—which will offer more levels of pressure sensitivity at lower prices. □



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Safer Copying

Processing User Input

BY NEIL J. RUBENKING

SAFER COPYING

Many DOS commands permit the use of wildcards to perform an operation on a set of files or directories. But if you aren't careful, this can have unexpected results. Have you ever copied the contents of one directory to another, inadvertently mistyping the destination? You don't get what you wanted, and worse yet, you get no error message. Here's a simple tip.

Suppose you want to copy all files in directory X to directory Y on the A: drive. What would happen if you type the command `COPY X A:Y`, and directory Y doesn't exist? The A: drive will contain only a new file called Y, and you won't get an error message.

That's not good. The following variation does produce an error if directory Y does not exist on the A: drive.

```
COPY X A:Y\*.*
```

Better still, use this command to protect against mistyping the source directory name:

```
COPY X\*.* A:Y\*.*
```

But typing `X\*.*` is a bit of a bother. I've discovered that the period is accepted by many DOS commands as a synonym for `*.*`, so I've been able to use

```
COPY X\ . A:Y\ .
```

I haven't yet encountered a version of DOS that won't accept a period for commands like `COPY`, `DIR`, and `PRINT`. One notable exception is the `FOR` command's list, in which a period is *not* the same as `*.*`.

I routinely append a backslash and period to any directory argument where

the directory should already exist. This has saved me numerous times from failing to copy what I wanted onto backup floppy disks and directories. Typing `\.` is about as easy as it gets, since it doesn't require the Shift key.

Fred C. Belsak

North Chelmsford, Massachusetts

► **PC MAGAZINE:** DOS's `COPY` command is a lot more versatile than most users realize, and it's one of `COPY`'s more obscure features that causes the problem noted above. `COPY` has the ability to concatenate files: The command `COPY A+B C` will create a new file, C, containing the contents of both file A and file B. When you `COPY` from a wildcard file specification to a single filename, `COPY` will concatenate all matching files and store the result in the target file. That's exactly what happens in the example `COPY X A:Y`. `COPY` treats the directory name X as equivalent to `X\*.*`, so it copies all files in the directory X to the single file Y on the A: drive.

But wait—It gets worse! By default, `COPY` uses *binary* mode, in which it copies every byte from source to target. But when concatenating files, `COPY` uses *ASCII* mode, in which the target is truncated at the first Ctrl-Z character. So the single file Y most likely does not contain all the data from the files in directory X.

In the solution offered, the period

doesn't actually substitute for `*.*`. Rather, it is a substitute for a directory name. Every subdirectory contains a directory entry whose name consists of a single period; this entry refers to the directory itself. In a DOS command, a lone period refers to the current directory, and a backslash and period following a directory name refers to that directory. In fact, you can keep appending backslash-period pairs to a directory name indefinitely (or until you run into the 127-character command-line limit). Try it! You will see that `DIR C:\.\.\.\.\.` yields precisely the same result as `DIR C:\.`

Adding a backslash and period to a directory name effectively leaves it unchanged, but the same is *not* true of filenames. By appending this pair of characters every time you use the name of a directory that should exist, you force DOS commands to halt with an error message if you mistype the directory name. That's better than finding out later that your archives are incomplete!

PROCESSING USER INPUT

I've found another way to give a batch file access to an input string. My version consists of two files, `INP.COM` and `INPUT.BAT`. `INP.COM` is a small program you can create with the `DEBUG` script in Figure 1, using the command

```
DEBUG < INP.SCR
```

The program waits for string input from a user, then creates a file named `TEMP.BAT` containing that input. `INP.COM` is a very simple program and no error checking is done after each DOS function call.

`INPUT.BAT`, shown below, uses `INP.COM` to assign an input string to an

► I N T H I S S E C T I O N Tutor 305 Utilities 313 Environments 331 Power Programming 343 Solutions 356
--

INPUT.SCR

Complete Listing

```

N INP.COM
E 144 "TEMP.BAT",0
A 100
MOV DX,0144 ; file name
MOV AX,3C00
MOV CX,0
INT 21 ; create file
PUSH AX ; file handle in stack
MOV CH,00
MOV CL,[000] ; length of command string
JNZ 11F ; skip if no command line
DEC CL ; drop first char (space)
POP BX ; get file handle
PUSH BX
MOV AH,40
MOV DX,002 ; command string offset
INT 21 ; write to file
MOV AH,0A
MOV DX,0144

MOV BYTE PTR [0144],50 ; max. length of 80 characters
INT 21 ; input string
MOV CH,00
MOV CL,[0145] ; length of string
POP BX ; get file handle
PUSH BX
MOV AH,40
MOV DX,0146 ; input string offset
INT 21 ; write to file
POP BX
MOV AH,3E
INT 21 ; close file
MOV AX,4C00
INT 21 ; exit to dos

R CX
4D
W
Q

```



Figure 1: This DEBUG script defines the file INP.COM, which makes it easy to get input from a user in a batch file.

environment variable:

```

@ECHO OFF
ECHO Enter a value for environment
variable %1:
INP SET %1=
CALL TEMP.BAT
DEL TEMP.BAT

```

Here's the syntax you should use: INPUT <variable name>. You can issue this instruction either from the DOS command line or within a batch file. Either way, don't forget that you will need to use the CALL command to execute INPUT from another batch file.

The following batch file, SAVE-
DIR.BAT, illustrates another way to use
INP.COM:

```

@ECHO OFF
CD|INP SET DIR=>NUL
CALL TEMP.BAT
DEL TEMP.BAT

```

FILEBYTE.BAT

Complete Listing

```

@ECHO OFF
REM FILEBYTE.BAT - Pass a file specification and
REM this batch file will tell you how many bytes
REM it occupies.
SET filebytes=0
IF '%1'=='' GOTO Report
IF NOT EXIST %1 GOTO Report
DIR %1 | FIND "file(s)" | INP CALL $FILEBYT.BAT>NUL
ECHO SET filebytes=%3>$FILEBYT.BAT
CALL TEMP.BAT
DEL TEMP.BAT
DEL $FILEBYT.BAT
:***** Report *****
ECHO %filebytes% bytes occupied by '%1'

```



Figure 2: FILEBYTE.BAT further processes input received by INP.COM, extracting a single number from the input line.

SAVEDIR saves the name of the current directory into an environment variable named DIR.

*Nuno Macedo Silva
Porto, Portugal*

► **PC MAGAZINE:** We've presented a number of ways for a batch file to obtain string input from a user, but INP.COM may be the easiest yet. The ability to process a line of input from the user is essential to many batch files. But INP.COM can also process the output of other programs and commands, as the SAVEDIR.BAT example shows.

Sometimes you'll want to deal with just part of a line of input. Rather than set an environment variable to the line, just have TEMP.BAT call another batch file. For example, the batch file FILE-
BYTE.BAT shown in Figure 2 gets the number of bytes occupied by a particular group of files and stores that number in an environment variable. It pipes the out-

put of the DIR command through the FIND filter, selecting the line that contains the word file(s), and this line is piped as input to INP.COM. INP.COM writes the string

```
CALL $FILEBYT.BAT
```

to the batch file TEMP.BAT, followed by the filtered output of the DIR command.

TEMP.BAT now con-

tains a line like this:

```
CALL $FILEBYT.BAT 2 file(s)
1393 bytes
```

The next line of FILEBYTE.BAT creates the temporary batch file \$FILE-
BYT.BAT, whose single line sets the e-var filebytes to the value of its third parameter. FILEBYTE.BAT executes TEMP.BAT, which in turn executes \$FILEBYT.BAT. Then it deletes the two temporary files and reports the number of bytes occupied by the file specification. The number remains available in the e-var filebytes.

You can modify this technique to extract data from the output of any program that writes to DOS standard output. The steps will be the same. First, you should use FIND to filter out everything but the line that contains the desired information. Pipe the output of FIND into INP.COM, and put the name of a temporary batch file on INP.COM's command line. Create the temporary batch file so that it sets an environment variable to the appropriate command-line parameter. Finally CALL TEMP.BAT and delete both temporary batch files. The data is now in an e-var!

You can download all of the files that are mentioned here from the Utilities/ Tips Forum on PC MagNet, archived as INPUT.ZIP. □

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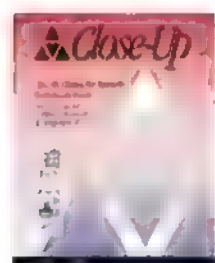
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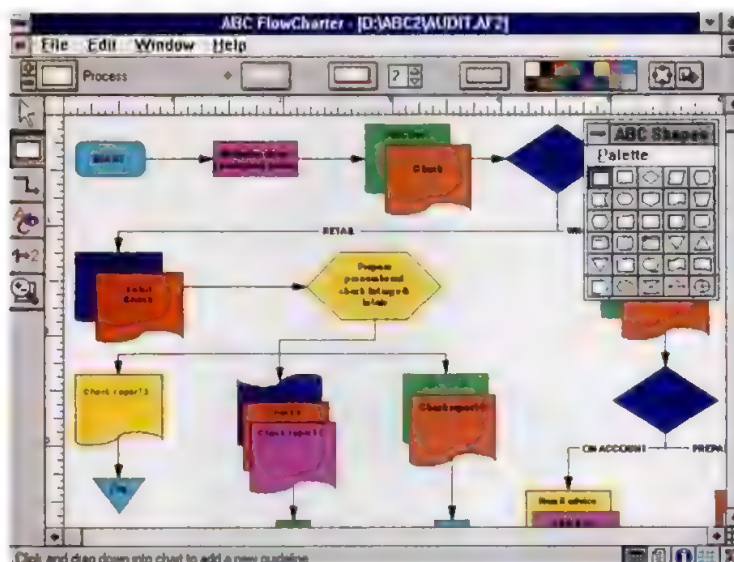
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Understanding Data Compression

BY JEFF PROSISE

One of the hottest topics in computer science these days is data compression—the art of shoe-horning large amounts of data into small spaces. Storage requirements are growing every day. Ten years ago, a 10MB hard disk could easily accommodate the storage requirements of dozens of programs. Today, if you use Windows and three or four Windows applications, it's hard to get by with less than 80MB. New technologies, such as real-time video playback and digitized sound reproduction, tax the capabilities of today's hardware even more, because a few seconds of uncompressed video or high-resolution sound can tie up several megabytes of storage space. Clearly, the advent of fast, efficient means of compressing data on PCs comes not a moment too soon.

Data compression comes in many forms. Utilities such as PKZIP compress data as a standalone operation so that you can fit more files on a disk or download files from bulletin boards in less time. Disk compression products such as Stacker and DOS 6's new DoubleSpace compress and uncompress data in real time. You may even benefit from data compression without knowing it. Most .PCX and .GIF graphics files, for example, have compression built in. That's why a .PCX or .GIF file is typically much smaller than a TIFF file of the same image. Even Windows .BMP files have an option for built-in compression.

There are two types of data compression: *lossless* and *lossy*. Lossless data compression algorithms ensure that no information is lost in the compression/decompression process; the decompressed version is exactly the same as the original. Lossy compression algorithms give up bit-for-bit accuracy for higher compres-

sion ratios. Lossless compression finds application in utilities such as PKZIP and in disk compression software. Lossy compression is typically used to compress video and sound images, where the loss of small amounts of data does not reduce the perceived overall quality of the output. Naturally, lossy compression would be anathema to a disk compression program, because losing a bit here or there could completely alter the meaning of the data.

To the person who's not familiar with common compression algorithms, data compression may seem more like magic than science. To help you understand

*Find out how PKZIP and
DOS 6's DoubleSpace
make your files smaller
using RLE, Lempel-Ziv-
Welch, probabilistic, and
Shannon-Fano algorithms.*

how this emerging technology works, we'll look at a very simple lossless compression algorithm known as *run-length encoding*. Then we'll briefly discuss the compression algorithms employed by PKZIP, Version 1.1 (ever wonder what PKZIP is really doing when it says "shrinking" or "imploding?") and DOS 6's DoubleSpace.

RUN-LENGTH ENCODING Run-length encoding, or RLE, is one of the simplest and most often used forms of lossless data compression. It works best with files that contain many consecutive occurrences of the same bit pattern, a characteristic that usually applies to bitmapped images.

Here's a simple example illustrating how RLE works. Suppose that you want to compress a file that contains the following 32 bytes of information:

```
00 32 46 00 00 00 00 05
99 02 02 02 01 01 01 01
01 01 01 01 01 01 01 64
00 00 00 00 00 00 00 00
```

If you examine the file closely, you'll notice that it contains several "runs" of bytes with the values 00 and 01. If you listed the file's contents in such a way that runs, or groups of repeating bytes, were listed on the same line, the file would look like this:

```
00
32
46
00 00 00 00
05
99
02 02 02
01 01 01 01 01 01 01 01 01 01 01
64
00 00 00 00 00 00 00 00
```

Now imagine what would happen if you replaced each line in this listing with 2 bytes: one identifying the number of bytes in the run, and another identifying the value of the bytes in the run. Written this way, the file would look like this:

```
01 00
01 32
01 46
04 00
01 05
01 99
03 02
11 01
01 64
08 00
```


With this simple form of encoding, you just compressed 32 bytes' worth of data into 20 bytes. Knowing the compression algorithm, a smart program could take the 20 encoded bytes and reproduce the original file by reversing the encoding process. RLE was incorporated into the specification for .PCX and .BMP files because long runs of identical characters are common in bitmapped images. The greater the number and length of repeating runs that a file contains, the higher the compression ratio that RLE can achieve.

There is a downside, however. In the worst case—if a file contained no repeating bytes—this simple form of RLE compression would double the size of the file. More efficient forms of RLE exist (forms that do not expand every nonrepeating byte into 2 bytes), but one must still be careful when choosing a compression algorithm. What's good for one file may not be ideal for another. That's why a well-written compression program must analyze a file before compressing it and must choose the compression method that is best suited to it.

PKZIP PKZIP, probably the world's leading file compression and archiving utility, chooses from three different compression methods—*shrinking*, *reducing*, and *imploding*—depending on the patterns of data that a file contains. If none of these methods is capable of reducing the file size, PKZIP simply copies the file unchanged to the ZIP file, a process called *storing*.

Shrinking uses a variation of the famous Lempel-Ziv-Welch (LZW) compression algorithm. LZW works by building a dictionary of phrases (groups of one or more characters) from the input stream. When a new phrase is encountered, the compression engine checks to see if that phrase is recorded in the dictionary. If not, the phrase is added to the dictionary and a token that identifies the phrase's position in the dictionary is output. If the phrase was already recorded, then the compressor simply outputs the token for the existing phrase. Whereas RLE lends itself well to sequences of data with repeating single characters, LZW works very well on data with repeating *groups* of characters. The English language uses many repeating character pat-

terns, so LZW is usually a good choice for compressing text files.

One of the factors that affect the efficiency of LZW compression is the length (in bits) of each output token, which in turn determines the maximum size of the dictionary. Tokens are typically from 9 to 15 bits in length. Larger tokens work better for large files, but smaller tokens frequently produce higher compression ratios in small files. PKZIP uses a dynamic sizing method that begins with 9-bit tokens and increases the token size as the size of the dictionary increases, up to a maximum of 15 bits per token. This technique works as well with small files as it does with large files because the final token size is a function of the file size. The chief difference between a classic implementation of LZW and the form that PKZIP uses is that when the dictionary becomes full, PKZIP only partially clears

***A well-written
compression program must
analyze a file before
compressing it.***

it of phrases. Many LZW compression engines clear the dictionary completely and start building phrases again from scratch.

Reducing is actually two algorithms in one. First PKZIP compresses repeating character sequences using an intricate form of RLE. Then it compresses the result using a probabilistic compression method. *Probabilistic compression* is based on the simple premise that you can compress a data stream by using varying numbers of bits to represent different characters (or character patterns) if characters that appear often are assigned the fewest number of bits and characters that appear infrequently are assigned the greatest number of bits. For example, suppose a word processing document contains 1,000 occurrences of the letter E but only 20 occurrences of the letter X. Stored as 8-bit ASCII text, the letters E and X would account for 1,020 bytes. Now suppose that the letter E could be represented in just 4 bits, while the letter

X could be represented with 16. Now E and X would account for only 540 bytes—500 bytes for the letter E (1,000 characters at 1/2 byte per character) and 40 bytes for the letter X (20 characters at 2 bytes per character). Clearly this is a more efficient way to store the data, and would result in a compression ratio of almost 50 percent.

This is a very simplistic illustration of how probabilistic compression works, and it ignores the fact that a probability table must be attached to the compressed data, partially offsetting the gains. PKZIP takes this idea a step further by assigning variable-length bit patterns not to single characters, but to pairs of characters. Also, in order to reduce memory consumption and the size of the probability table, PKZIP limits the table to 32 patterns beginning with a given character. That's fine for text files, because while there may be many occurrences of the characters NE, there will likely be no occurrences of, say, QX. The maximum length of the probability table is 256 (which is the number of characters that can be represented with an 8-bit value) times 32 (the number of combinations supported for each starting character) bytes, or 8K, plus a few bytes extra for overhead. In reality, the table is usually much smaller—especially if the data file itself is not very large.

Imploding also employs two discrete data compression algorithms. First the data is compressed using a form of Lempel-Ziv (LZ) compression called *sliding dictionary*. Sliding dictionary LZ is similar to LZW in that it identifies repeating phrases by outputting tokens that tell the decompression program where in the file the phrase occurred before. But instead of checking the entire file for matching phrases, it uses only part of the file—specifically, a fixed-size block whose address is repeatedly incremented as the file is read. Hence the term “sliding dictionary.” PKZIP uses a 4K or 8K block size, which strikes a reasonable balance between compression ratio (the larger the block size, the more the data can be compressed) and compression speed (the larger the block size, the more time it takes to check for repeating patterns). This is a classic form of data compression, and one that, like LZW, lends itself well



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to data streams with repeating character sequences.

After it is compressed using the sliding dictionary method, imploded data is then compressed again using *Shannon-Fano trees*. The Shannon-Fano algorithm is a form of minimum redundancy coding that, like the probabilistic compression method described earlier, represents oft-repeated characters with fewer bits than seldom-used characters. Shannon-Fano was one of the very first compression algorithms, developed in the late 1940s by Claude Shannon of Bell Labs and R.M. Fano of M.I.T. The term *tree* comes from the method normally used to implement Shannon-Fano compression, which involves counting the occurrences of each character and constructing a binary tree of 1s and 0s where characters represent "leaves." To determine the numeric code for a given character, you begin at the top of the tree and follow the branches until you reach the specified character. Each branch represents one bit of information. Often-used characters appear closer to the top of the tree, and hence require fewer bits to represent in compressed form.

In December, PKWare introduced PKZIP, Version 2.04g, which replaces the three methods of data compression used in previous versions—shrinking, reducing, and imploding—with a single method called *deflating*. Deflating is similar to imploding except that it uses a larger (32K) dictionary size and a more sophisticated form of Shannon-Fano encoding, resulting in higher compression ratios.

The process of uncompressing a file is usually far easier—and less CPU-intensive—than compressing it. If you'd like to see how PKZIP files are unzipped, you should check out Michael Mefford's PCUNZIP utility, which appeared in *PC Magazine's* March 31, 1992, Utilities column. You can download it, source code and all, from the Utilities/Tips Forum on PC MagNet, archived as PCUNZIP.ZIP. Better yet, you can use it to unzip compressed files downloaded from on-line services.

DOUBLESPEACE DoubleSpace—the disk compression driver built into DOS 6—uses a form of sliding-dictionary LZ compression similar to the form PKZIP uses

when it "implodes" a file. DoubleSpace uses a 4K sliding dictionary to encode often-repeated phrases as tokens that consist of an offset from the start of the current phrase to an earlier occurrence of the same phrase, and a count byte that identifies the number of characters in the phrase. The greatest difference, of course, between DoubleSpace and compression programs such as PKZIP is that DoubleSpace does all its compression and decompression behind the scenes. DoubleSpace automatically compresses data on its way to a disk and uncompresses it when it is read back. PKZIP, by contrast, must be run manually each time you want a file or group of files compressed.

Borrowing an example from the reviewer's guide that Microsoft distributed to members of the press prior to the release of MS-DOS 6, the phrase

```
therain in Spain falls mainly on
the plain
```

which requires 43 bytes, would be encoded as

```
the rain <3,3>Sp<9,4>falls
m<11,3>ly on<34,4>p<15,3>
```

which requires only 37. Numbers in angle brackets represent tokens; the token <9,4> means "repeat the 4-character sequence that began 9 characters to the left of this token." If you work your way through the encoded text from left to right replacing tokens with literal text, you'll reproduce the original, unencoded message. That's exactly what DoubleSpace does when it expands data read from a compressed volume.

FURTHER READING If you're interested in learning more about data compression methods, there are several books available on the subject. My personal favorite is *The Data Compression Book*, by Mark Nelson (M&T Books, 1992). Unlike many other books on data compression, *The Data Compression Book* is short on equations and long on clear, thoughtfully written explanations. It discusses lossy as well as lossless compression methods, and, for the programmer, it contains plenty of source code examples written in C. □

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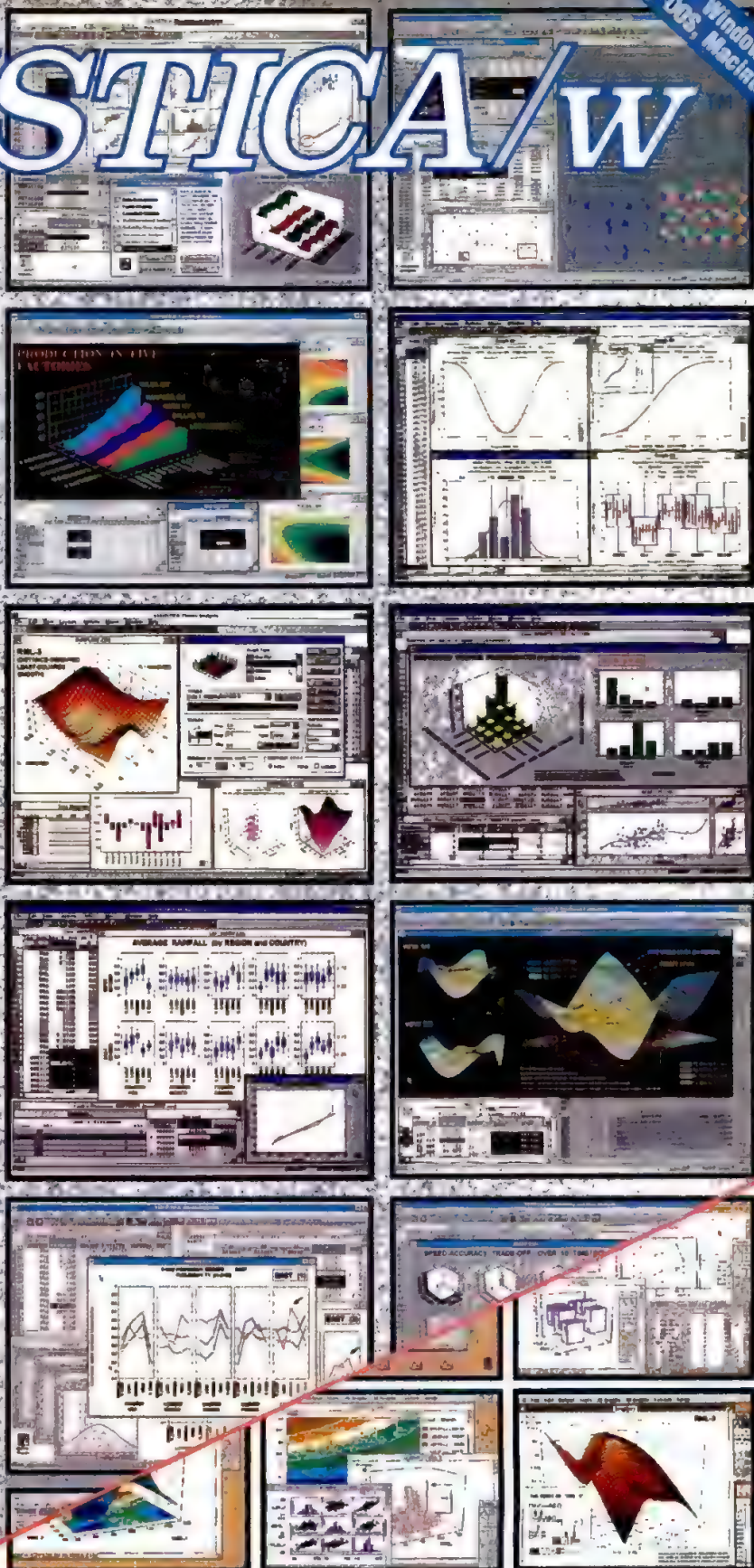


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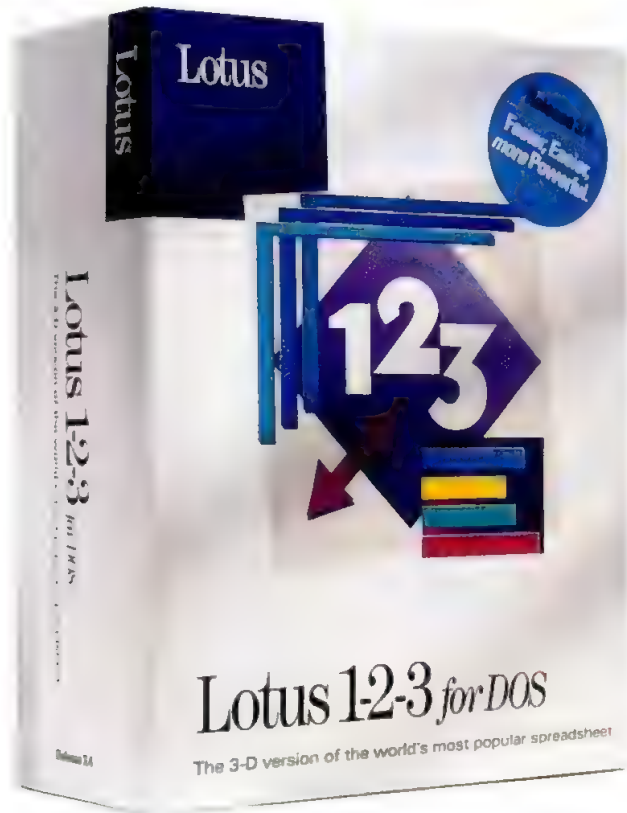


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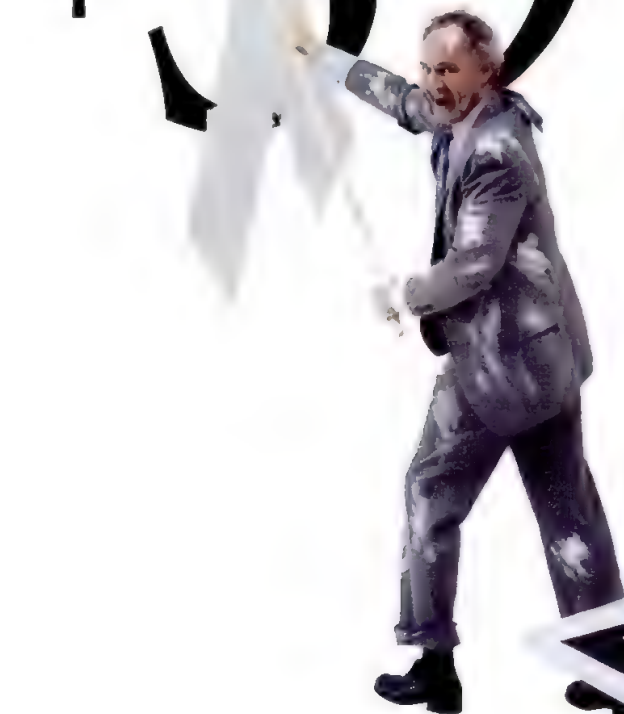
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A Function Library For WINCMD

BY DOUGLAS BOLING

Our WINCMD utility gave you a command language interpreter for Windows 3.1. This issue enhances the WINCMD language by adding WCLIB, a DLL (dynamic link library) whose new functions will let you move and size windows, read and write files, access the Windows Clipboard, and even control your multimedia devices from a WINCMD program.

You can download both WINCMD.EXE and WLIB.WCL from the Utilities/Tips Forum of PC MagNet, as explained in the "Utilities by Modem" sidebar. You will also need to review the original WINCMD article (*PC Magazine*, April 27, 1993) to learn the keywords, syntax, functions, and so on that WCLIB augments. The C language source code and related files for WINCMD.ZIP and WLIB.ZIP are also available in the Utilities/Tips Forum of PC MagNet.

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USING WCLIB To install WCLIB, you must copy WCLIB.WCL into the same directory as WINCMD.EXE. When WINCMD is started it will automatically add all the new WCLIB functions to the WINCMD language. You use the WCLIB functions exactly as you would the standard WINCMD functions: Just enter the name of the function, followed by its parameters enclosed in parentheses.

WCLIB's new functions can be di-

vided into four functional groups: window management, file access, multimedia, and Clipboard. A table listing them all is shown in Figure 1.

WINDOW MANAGEMENT GROUP The function `GetWindowHandle()` returns the *handle* for a window on the screen. In Windows programming jargon, a handle is a number that a program uses when referring to a window. To get the handle of the Program Manager's main window, you would use the function

```
proghand = GetWindowHandle("Program
Manager")
```

In WCLIB, knowing a window's handle is the key to controlling that window. The standard functions included in

*With WCLIB, you can
expand your WINCMD
programs to give you
complete control over
your Windows desktop.*

WINCMD, such as `AppActivate()`, always refer to windows by their title bar text. Unfortunately, not all windows have a title bar or other text. The WCLIB functions that involve windows use the window handle instead and so can reference any window on the screen.

The next two functions, `SizeWindow()` and `MoveWindow()`, let a WINCMD program set the size and position of windows on the screen. `SizeWindow()` takes three parameters: the handle of the window, the new width, and the new height. The latter two parameters are specified in pixels. For example, to resize

the Program Manager window to a window 300 pixels wide by 200 high, you'd use the following lines:

```
handle = GetWindowHandle("Program
Manager")
SizeWindow (handle, 200, 300)
```

`SizeWindow()` returns TRUE (any non-zero value) if the function was successful and FALSE (a zero value) if it was not.

The `MoveWindow()` function similarly takes three arguments: the window handle, the horizontal position, and the vertical position. To parallel the previous example, to move the Program Manager window to the top-left corner of the screen, the commands would be

```
handle = GetWindowHandle("Program
Manager")
MoveWindow (handle, 0, 0)
```

As with the `SizeWindow()` function, `MoveWindow()` returns TRUE if the function was successful in moving the window and FALSE if it was not.

While you often want to move and size a window, there are times when you simply wish to minimize or maximize it. To minimize a window to an icon, you use the function `MinimizeWindow()`, whose only parameter is the handle of the window. Similarly, `MaximizeWindow()` zooms a window to cover the entire desktop, and `RestoreWindow()` restores a window from an iconic or maximized state. Both also take only the window handle as a parameter. All three of these functions return TRUE if the function was successful and FALSE otherwise.

Since being able to learn the specific position and size of a window is just as important as being able to move or size it yourself, WCLIB includes three functions that return information in this area.

GetWindowSize() takes one parameter, the window handle, and it returns the size of the window. Both the width and height of the window are encoded in the one returned parameter. The width of the window is contained in the lower half of the returned value; the height is contained in the upper half. To separate the two values, you can use the HighWord() and LowWord() functions. For example, the following code fragment will display the size of the Program Manager's window:

```
size = GetWindowSize
(GetWindowHandle("Program
Manager"))
Say "The Program Manager window is"
HighWord(size) "high and"
LowWord(size) "wide"
```

As discussed in the last issue in connection with the WINCMD language, the SAY statement simply displays text in the WINCMD.EXE window.

Notice in this example that instead of using a separate line to get and save the handle of the Program Manager window, I simply included the GetWindowHandle() function in the call to GetWindowSize(). While this is not necessary, some people find it convenient to write programs this way. It reduces the number of lines in the program and eliminates the need to create a variable to hold the window handle. Note too that it might be good to check the GetWindowHandle() result before passing it on to GetWindowSize().

The GetWindowPos() function is similar to GetWindowSize(). Its single parameter is the window handle, and it returns the position of that window encoded in the returned value. Thus, by making only a few minor changes to the previous example, you can display the position of the Program Manager's window thus:

```
pos = GetWindowPos
(GetWindowHandle("Program
Manager"))
Say "The Program Manager window is
at row" LowWord(pos) "and column"
HighWord(pos)
```

GetWindowState() returns the state—iconic, restored, or maximized—

The New WCLIB Functions

Window Management Functions		Action
GetWindowHandle (title text)		Returns the handle of the window with the matching title text
SizeWindow (window handle, cx, cy)		Resizes a window
MoveWindow (window handle, x, y)		Moves a window
MinimizeWindow (window handle)		Minimizes a window
MaximizeWindow (window handle)		Maximizes a window
RestoreWindow (window handle)		Restores a window
GetWindowSize (window handle)		Returns the size of a window
HighWord (number)		Returns the upper 16 bits of a number
LowWord (number)		Returns the lower 16 bits of a number
GetWindowPos (window handle)		Returns the x and y coordinates for a window
GetWindowState (window handle)		Returns the state (icon/restored/zoomed) of a window
GetWindow (window handle, relation)		Returns the handle of a window related to a window
GetWindowText (window handle)		Returns the title text for a window
PostMessage (window handle, message number, word param, long param)		Posts a message to a window
SendMessage (window handle, message number, word param, long param)		Sends a message to a window
LoadIconFile (icon filename)		Loads an icon and returns an icon handle
SetIcon (window handle, icon handle)		Sets a window's icon
Multimedia Functions		
SendMCIString (MCI string)		Sends an MCI command string
GetMCLErrorString (MCI error number)		Returns an error message for an MCI error number
File Functions		
FileOpen (filename, access mode)		Opens a file
FileMovePtr (file handle, offset, flag)		Moves a file read/write pointer
FileRead (file handle, bytes to read)		Reads bytes from a file
FileWrite (file handle, data to write)		Writes data to a file
FileClose (file handle)		Closes a file
FileExist (filename)		Determines whether a file exists
Clipboard Functions		
GetClipText ()		Retrieves text from the Clipboard
SetClipText (data for Clipboard)		Sets the Clipboard contents

Figure 1: By adding the new functions provided by WCLIB.WCL, you can write far more powerful programs in the WINCMD command language. The functions are listed in the order they appear in the text.

of a window. This function takes a window handle as its one parameter and returns a 1 if the window is in a restored state, a 2 if the window is being displayed as an icon, and a 3 if it is maximized.

GetWindow() is a powerful function that can be used to track the relationships between a window and its parent, owner, or children. The function takes two parameters: the handle of the window, and a parameter that requests that a specified relationship will return a TRUE (non-zero) value. Figure 2 lists the relationships that can be requested and the value of the second parameter to request that relationship. GetWindow() returns the

window handle for the window that has the specified relationship. If no window meets the relationship requested, or if either parameter passed to GetWindow() is invalid, the function returns FALSE.

Unfortunately, to explain these window relationships would take an entire article in itself. For those who are interested in learning more about the subject, the best text is the classic *Programming Windows*, by PC Magazine contributing editor Charles Petzold.

The GetWindowText() function is the inverse of GetWindowHandle(). It returns the title text of a window from the window handle passed to it. This function

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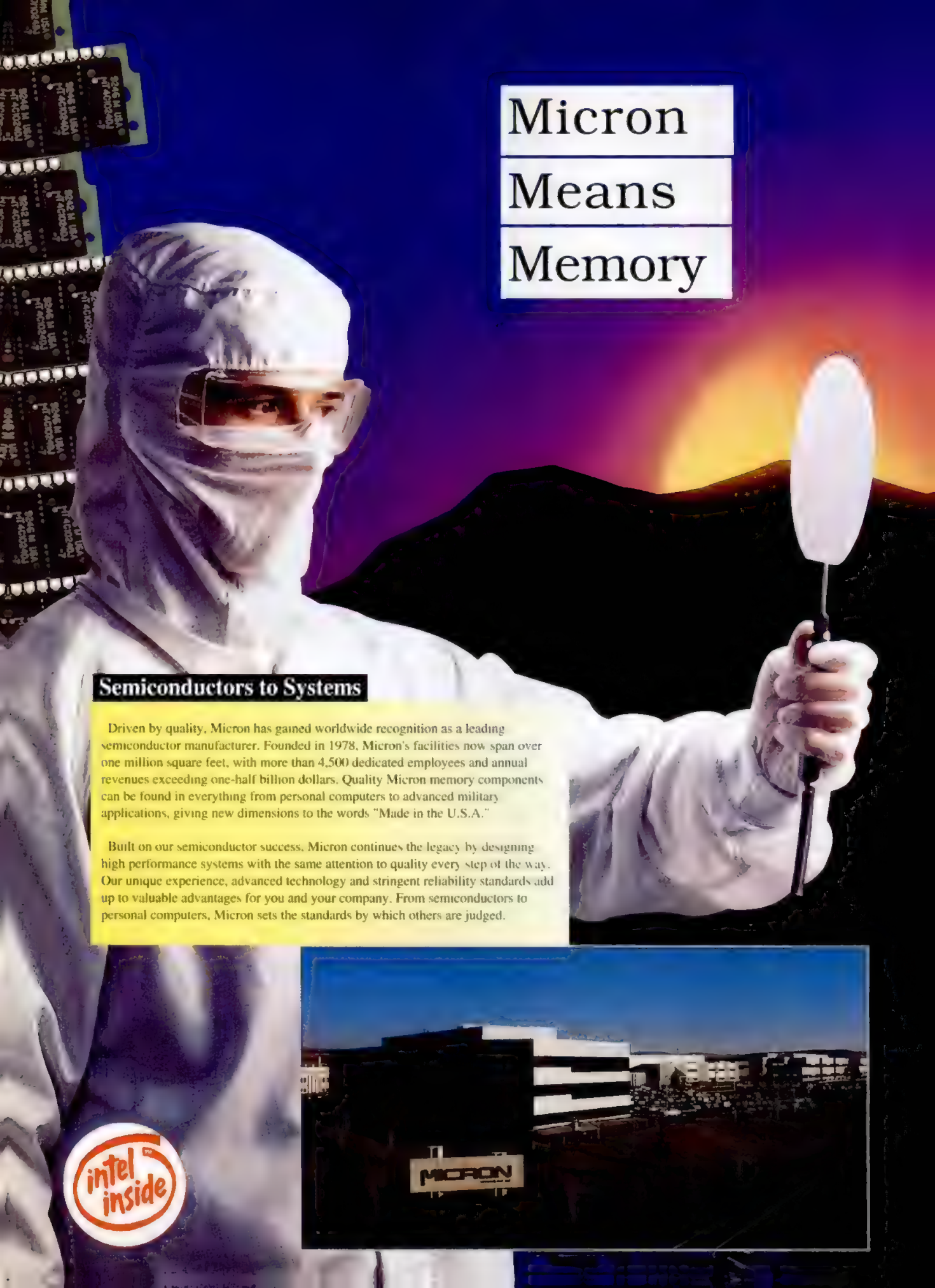
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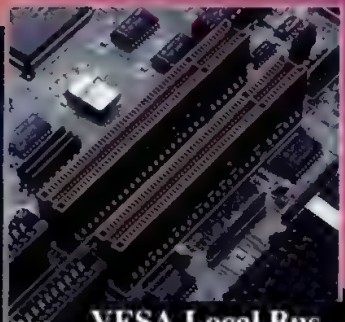


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provides an easy way to convert a window handle returned by `GetWindow()` into a title that can be used by `AppActivate()` and the other functions of WINCMD that require title text.

The next two functions, `PostMessage()` and `SendMessage()`, give a WINCMD program access to the very heart of Windows: the message architecture. Messages are the commands and notifications sent to windows by other windows and by Windows itself. As with `GetWindow()`, a complete explanation of window messages is beyond the scope of this article, but the functions are included in the WCLIB repertoire to give WINCMD programs an additional level of functionality.

Both `PostMessage()` and `SendMessage()` take four parameters: the handle of the window to which the message is to be sent, the message value, the word

parameter for that message, and the long parameter. `PostMessage()` returns a zero if the function fails, and a nonzero otherwise. `SendMessage()` returns the value returned by Windows' `SendMessage()` call.

A handy use for `PostMessage()` is to tell an application to terminate by posting a `WM_QUIT` message to it. For example, to tell the File Manager to terminate, you would use the following line:

```
PostMessage (GetWindowHandle("File
Manager"), 0x12, 0, 0)
```

Windows has hundreds of different messages. Again, the best source for learning about these messages is Charles Petzold's *Programming Windows*. Since window messages are normally referred to by their names rather than by their actual number values, you will need to refer

to the file `WINDOWS.H`, which is included with the Windows Software Development Kit and with other Windows development environments. You must be very careful when using `SendMessage()` and `PostMessage()`, since sending the wrong message at the wrong time can be disastrous to the target window and even to Windows itself.

The last two functions in the window management group are `LoadIconFile()` and `SetIcon()`. These are designed primarily to allow a WINCMD program to set the icon of its own window, but with care they can also be used to set the icons for other windows on the desktop. `LoadIconFile()` takes the filename of a Windows icon file as its only parameter. If the file is successfully loaded, `LoadIconFile()` returns a handle to the icon.

The two `SetIcon()` parameters are the handle of a window and the handle of the icon to use. The function returns the handle of the icon that the window used previously. For example, to set the icon of a WINCMD window with an icon from the file `TRASH.ICO`, the statements would be

```
hicon = LoadIconFile ("TRASH.ICO")
if (hicon <> 0)
    holdicon = SetIcon (hmain, hicon)
```

In this example, the file `TRASH.ICO` is loaded and the variable `hicon` is set to the icon handle. If the load fails, `hicon` will be zero. The IF statement allows the WINCMD window icon to be set only if the icon from `TRASH.ICO` was loaded successfully. Note that this example is the first use of WINCMD's predefined variable `hmain`, which is automatically set to the handle of the WINCMD window. The only other predefined variable in the WINCMD language is `hinst`, which is the instance handle for the current instance of `WINCMD.EXE`.

MULTIMEDIA FUNCTIONS Microsoft bundled its Multimedia Windows software with the standard Windows 3.1. The multimedia interface itself is fairly complex: It has over 100 APIs! Fortunately, however, Microsoft also provided a high-level interface, called the Media Control Interface (MCI), which provides a much simpler way to communicate with multimedia devices. Included in the MCI inter-

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GETWINDOW() Relationships

Value	Meaning
0	First sibling for a child window
1	Last sibling for a child window
2	Next sibling for a child window
3	Previous sibling for a child window
4	The owner of the window
5	The first child window of a window
6	The parent of a window

Figure 2: The second parameter to GetWindow() must specify one of these allowed values.

face is a call that allows programs to use ASCII strings to command multimedia devices. (Make sure you don't confuse these strings with those you may use to get your e-mail!)

The WCLIB SendMCIStrng() function allows WINCMD programs to send MCI command strings to a multimedia device. The single parameter to SendMCIStrng() is the command string to send. If the command sent was successful, SendMCIStrng() returns any response the command returns. If the command fails, SendMCIStrng() returns the string ERROR, followed by the MCI error number that was returned. For example, if you sent the command

```
SENDMCISTRNG ("open cdaudio")
```

a response of ERROR 291 would indicate that the CD-AUDIO device was already in use.

The GetMCIErrString() function lets a WINCMD program translate an error number returned by SendMCIStrng() into a string that describes the error. The one parameter required is the error number returned by SendMCIStrng(). Note, however, that a WINCMD program must parse the error string returned by SendMCIStrng() in order to separate the error number from its preceding ERROR string. For example, the following lines will display an error string if an MCI string command fails:

```
answer = SendMCIStrng (string)
if (Substr (answer,0,5)
== "ERROR")
    say answer GetMCIErrString
    (substr (answer, 6, 10))
else
    say answer
```

The MCIPLAY.WCM program shown later in this article further illustrates the use of these two multimedia functions.

FILE FUNCTIONS The WCLIB file functions allow you to read and write files. FileOpen() opens or creates a file for operation. The function takes two param-

eters: the name of the file to open and the access mode. The allowable access mode values are 0 for read-only, 1 for write-only, and 2 for read/write access. FileOpen() returns a file handle that must be used for all other file functions.

The FileMovePtr() function changes the position of the file read/write pointer; for example, the location in the file from which data will next be read or to which it will next be written. The function takes three parameters: the file handle, the pointer offset value, and a flag that indicates the method to be used when changing the pointer. The method flag can be set to one of three values. A 0 indicates that the file pointer should be moved to the specified offset from the start of the file. A method flag setting of 1 indicates that the offset should be made from the current file pointer position, and a 2 indicates that the pointer should be offset from the end of the file.

FileMovePtr() returns the new value of the file pointer for the file. For example, to set the file pointer to 100 bytes from the start of a file, the command would be

```
FileMovePtr (hFile, 100, 0)
```

To move the file pointer ahead 300 bytes,

WORDFIX.WCM

Complete Listing

```
//=====
// WinCmd program to fix problems with WinWord
//
// Copyright (c) 1993 Douglas Boling
//=====
//
// Check to see if Word already running. If so,
// just switch to Word Window and exit
//
handle = checkrunning ("Microsoft Word")
if (handle) do
    appactivate (getwindowtext (handle))
    exit
end

//
// Launch Word and wait .5 seconds
//
"winword.exe"

delay (500)

//
// Attempt to get handle to Word's main window. If
// we can't quit.
//
handle = CheckRunning ("Microsoft Word")
if (handle == 0)
    exit

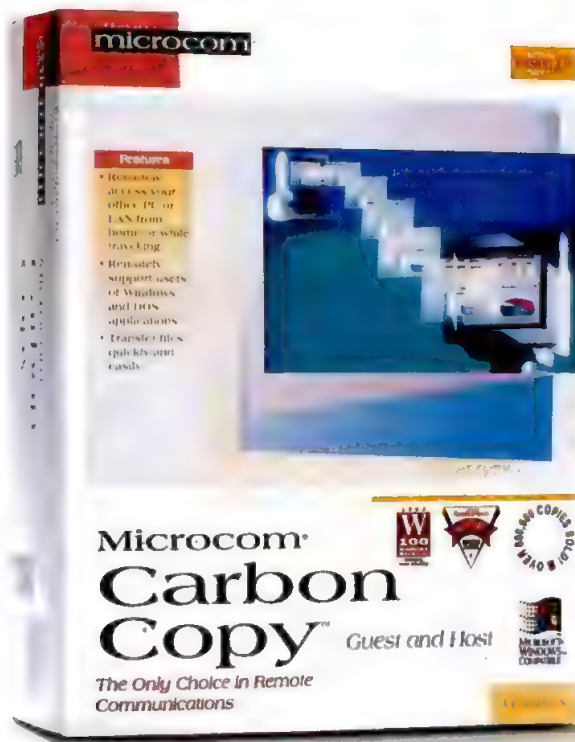
//
// Move and size window to my specs
//
MoveWindow (handle, 200, 15)
SizeWindow (handle, 900, 950)
```

```
exit

//=====
// CheckRunning - A routine that scans all windows to see
// if a window has a partial matching title text
//=====
checkrunning:
//
// Get first window in window list
//
handle = getwindow (hmain, 0)
//
// Loop until no more windows
//
while (handle <> 0) do
    //
    // Get window text
    //
text = getwindowtext (handle)
    //
    // If the first part of the window text matches the
    // argument passed to CheckRunning return handle
    //
if (substr (text, 0, length(arg(1))) == arg(1))
    return handle
    //
    // Get next window handle in window list
    //
handle = getwindow (handle, 2)
end
//
// No matching window found, return 0
//
return 0
```

Figure 3: The WINCMD WORDFIX program manages the way Word for Windows starts.

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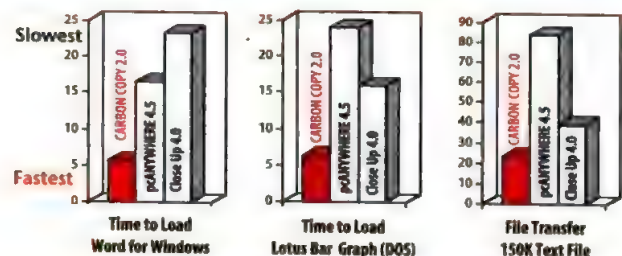
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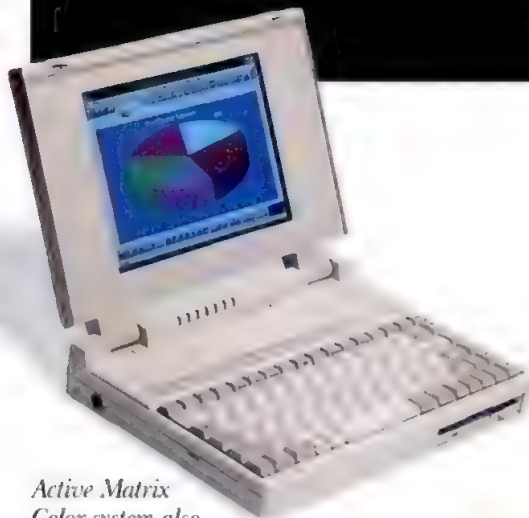
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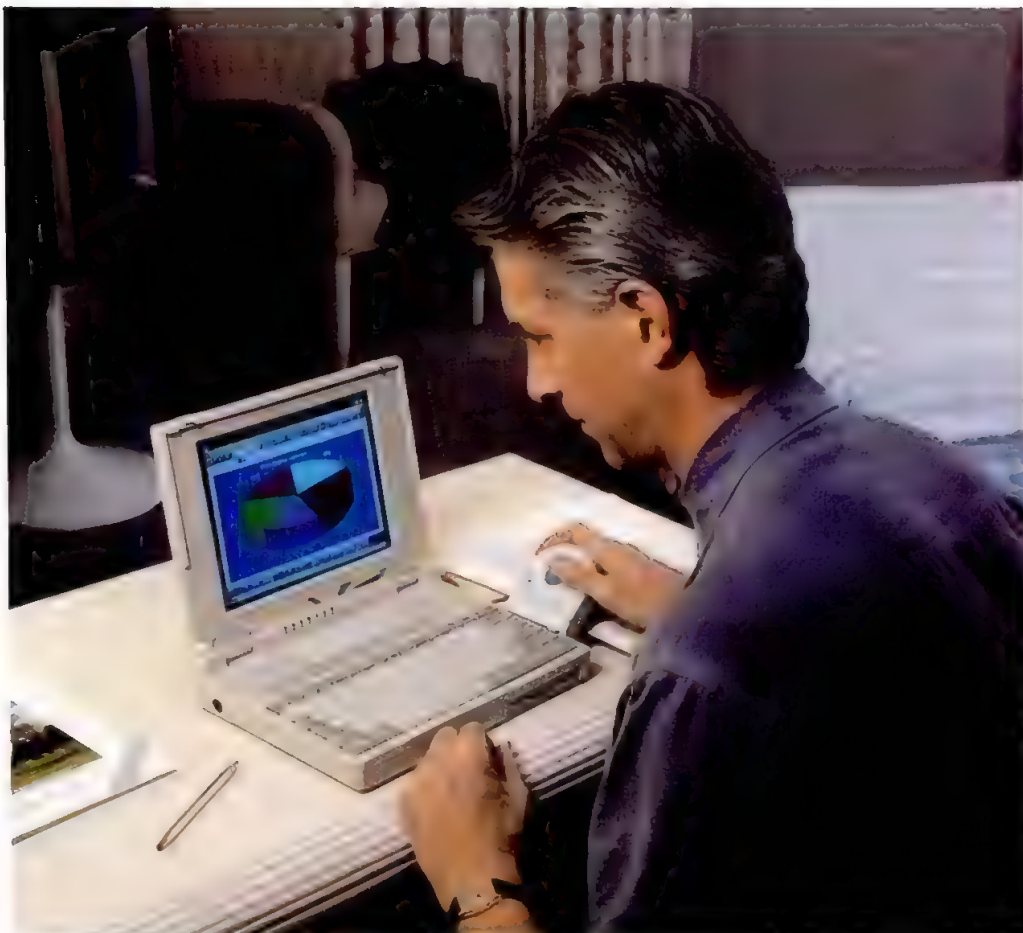
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■ PC Magazine Utilities Updates

As with all good software, the programs presented in *PC Magazine* are upgraded and improved. Here's a partial list of the programs on PC MagNet that have been updated. To download these files from the Utilities/Tips Forum, type GO ZNT:TIPS, type LIB or select Libraries from the menu, then select Library 2 PCMAG UTILS. Type DOW and the filename listed below (for example, DOW ANSI.COM), or select Download a File from the menu.

ADDIT.COM, Version 1.1

ANSI.COM, Version 1.3

BAT2EXEC.COM, Version 1.5

BCOPY, Version 1.2

CARDFILE.COM, Version 1.1

CHKFRAG.EXE, Version 1.7

CONFIG.CTL, Version 3.0

DIRMATCH.COM, Version 3.1

EMMA.COM, Version 2.2

EMS40.SYS, Version 1.1

PCACCESS.EXE, Version 1.1

RN.COM, Version 3.0

SLICE.COM, Version 1.3

SNIPPER.COM, Version 1.2

ZCOPY.COM, Version 1.4

For a list of the programs that are available on PC MagNet, download PCMCAT.ZIP from Library 1 (General Info) of the Utilities/Tips Forum.

you would use the command

```
FileMovePtr (hFile, 300, 1)
```

Similarly, to set the file pointer to 200 bytes from the end of a file use

```
FileMovePtr (hFile, -200, 2)
```

A common use for this last method of flag setting is to find the size of a file. If you move the file pointer to an offset of 0 from the end of the file, the returned value will be the file size. These examples all assume that the file has been previously opened and that the file handle has been assigned to the variable hFile.

The `FileRead()` function reads bytes from a file and takes as its two parameters the file handle and the number of bytes to be read. The return value for the function is the actual data read, which can be assigned to a WINCMD variable by using the equal sign (=), as explained in the last issue. The read is performed from the current position of the file pointer. After the read is done, the file pointer is updated to point to the byte following the last byte read. If there are no more bytes in the file to read—if the file pointer is pointing to the end of the file—`FileRead()` returns -1.

`FileWrite()` does the complementary job of writing to a file. It also takes two parameters, the handle of the file, and a *variable* that contains the data to be writ-

ten. `FileWrite()` returns the number of bytes written to the file. If the file handle is invalid or if the file is read-only, `FileWrite()` returns 0.

The `FileClose()` function closes a file and takes as its only parameter the handle to that file. WINCMD programs should always close any files that have been opened before the program terminates.

Finally, the `FileExist()` function determines whether a specified file exists. The function takes the *name* of the file as its one parameter and returns TRUE if the file exists, FALSE otherwise. Note that the filename passed to `FileExist()` can contain wildcards.

CLIPBOARD FUNCTIONS The final two functions allow WINCMD programs to read and write text to the Windows Clipboard. `GetClipText()` takes no arguments and simply returns any text data in the Clipboard. If the Clipboard is empty or if the data there cannot be rendered in a text format (if it contains a bitmap, for example,) `GetClipText()` returns 0. `SetClipText()` empties the Clipboard and then sets it to whatever text has been passed to the function. The function takes one argument: the text to be placed in the Clipboard.

WCLIB AT WORK The WINCMD program, WORDFIX.WCM, shown in Figure 3, demonstrates some of the new functions of WCLIB in the process of solving two of my major problems with

Word for Windows. One of these is that Word does not remember its size and location on the screen between launches. The other is that the application displays a message box demanding SHARE if a second copy is launched. WORDFIX fixes the message box problem by first checking to see if Word is already running and, if so, switching the original Word window to the foreground. If Word is not running, WORDFIX starts the program and then moves and resizes its window.

The WORDFIX subroutine `CheckRunning` checks the title text of every window on the desktop to see whether a Word window is currently open on the screen. This check consists of using `GetWindow()` to return the first window in the window manager list. (The window manager is the part of Windows that manages the windows on the desktop.) The routine then gets the title text for that window and compares it to the target window text—in this case, the string "Microsoft Word". If the text matches, `CheckRunning` returns the handle of the window. Otherwise, `GetWindow` is called again to get the next window in the window manager list and loops back. The loop ends after the last window has been checked.

The value returned by `CheckRunning` is compared with 0 to see whether Word is running. If so, `AppActivate()` is called to bring Word to the foreground. Since `CheckRunning` returns a window handle and `AppActivate()` needs the title text of a window, `GetWindowText()` is used to convert the handle into the necessary title bar text.

Note that the `CheckRunning` subroutine provides a way around the `GetWindowHandle()` limitation I mentioned toward the beginning of this article, namely, that the function will fail if a window adds text on its title line beyond what you have specified.

If Word is not running, WORDFIX launches it and waits half a second to allow Word to display its main window. `CheckRunning` is called again to return the handle to the Word window. If for some reason Word did not start, WORDFIX simply terminates. Otherwise, `MoveWindow()` and `SizeWindow()` are called to place the Word window exactly

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where you want it on your screen. WORDFIX quietly terminates when it has completed its business.

One endearing feature of WINCMD programs is that they can be hidden behind any icon in the Program Manager. I have WORDFIX in my Programs group with the Word for Windows icon set instead of the default WINCMD icon. This way it looks as if I am simply starting Word, when in fact I'm using a WINCMD program to start the application.

The MCIPLAY.WCM program, which is shown in Figure 4, uses the MCI string interface to let you control multimedia devices on your system. The program is rather straightforward. It consists of the MCI string functions discussed earlier, the AskBox() function which is used to query the user for the MCI command, and a WHILE loop that continues the process until the user has pressed the CANCEL button on the dialog box. The SAY statement is used to display any return messages from the MCI.

If you have the file GONG.WAV in your Windows directory, you can hear MCIPLAY in operation by entering

```
open waveaudio
play waveaudio!\windows\gong.wav
close waveaudio
```

HOW WINCMD AND WCLIB WORK Space limitations in the earlier issue precluded a technical discussion of the WINCMD interpreter, so I'll review that program before considering WCLIB. The operation of the WINCMD interpreter centers around its variable list. This list contains all the keywords of the WINCMD language—IF, WHILE, DO, and so on—plus all the words that have been tokenized from the ASCII file that the interpreter is currently executing as a WINCMD program.

The process of running a WINCMD program can be divided into three steps: resetting the interpreter, loading and tokenizing the WINCMD program, and interpreting the program's token list. The first step involves loading the variable list with the WINCMD language keywords. Keywords are loaded into the list together with pointers to the routines in WINCMD.EXE that will actually execute the keywords' functions. Thus the IF

```
//=====
// MCIPLAY - A WinCmd program that sends command strings using
// the SendMCIStrng function
// Copyright (c) 1993 Douglas Boling
//=====
//
// Ask the user for an MCI string command
//
string = AskBox ("Enter MCI String", " ")
//
// See if the user pressed the cancel button
//
if (a+string == a)
    string = EXIT
//
// Loop until cancel pressed
//
while (string <> exit) do
    //
    // Send the MCI string
    //
    answer = SendMCIStrng (string)
    //
    // Check for errors. If error, print error string
    //
    if (substr (answer,0,5) == "ERROR")
        say answer getmcierrostring (substr (answer, 6, 10))
    else
        say answer
    //
    // Get next command
    //
    string = AskBox ("Enter MCI String", string)
    if (a+string == a)
        string = EXIT
end
exit
```

Figure 4: MCIPLAY is a WINCMD program for controlling multimedia devices.

keyword is loaded with a pointer to the LocalIF routine in WINCMD.EXE, for example. The command line parameters are then loaded into the variable list so that they will be accessible to the program. At this point, any function libraries with a .WCL extension are called to load their functions into the variable list as well. (I'll discuss what happens when a .WCL library is loaded shortly.)

Once the variable list has been initialized, the WINCMD program to be executed is read into a block of global memory. The file is then scanned, a word at a time, with the first character of each word determining how the WINCMD tokenizer treats the word.

If the word begins with a letter or an underscore, it is treated as a variable name. WINCMD.EXE then searches the variable list to see whether the word is already there. If it's not, the word is added to the variable list and a pointer for the entry is added to another list, called the *line token list*. (This list consists

mainly of pointers to tokens in the variable list.) The order of the pointers in the token list is the same as the order of the words in the WINCMD program.

At this point the interpreter is converting the ASCII words in the WINCMD program into pointers to variables and keywords in the variable list. Thus when WINCMD is subsequently executed, the interpreter only has to work with the pointers and does not need to retokenize each line as it is executed.

There can be other items in the line token list besides pointers to entries in the variable list. If the word being parsed does not begin with a letter or an underscore but with a number, the interpreter converts the word into a 32-bit number that is added to the token list as a numeric constant. If the tokenizer sees a double quote character, it assumes that anything up to the next quote is a string constant. Instead of adding the quoted string to the variable list, the tokenizer adds it to the line token list as a string constant.



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To summarize the tokenization process, let's look at the simple, three-line WINCMD program listed below.

```
FRED = 5
IF (BOB < 5)
  BOB = FRED + 3
```

This program begins as an ASCII file. After the file has been parsed, the variable list contains all the keywords plus two variable names, FRED and BOB:

```
While
Do
If
=
>
<
+
-
.
.
.
BOB
FRED
```

The original values assigned to the variables are the names of the variables, that is, FRED is assigned the string "FRED" and BOB is assigned the string "BOB". As shown in Figure 5, the token list contains such items as line-number tokens, variable-pointer tokens, and numeric-constant tokens. Note that the items in the line token list are in the same order as the words from the original file.

Once a WINCMD program has been tokenized, the only remaining task is to execute it, starting with the first item in the line token list. If the item is a pointer to a variable, the second item is checked to see if it is an equal sign. If so, the items beyond the equal sign are evaluated, and the result is assigned to the variable at the start of the line.

In the example shown in Figure 5, the first line starts with the variable FRED, so the interpreter checks to see if the second item is an equal sign. Since it is, the interpreter evaluates the rest of the items on that line and assigns the result (in this case 5) to the variable FRED. After the first line of the program has been executed, the entry in the variable list for FRED also contains the value 5. Since nothing has been assigned to the variable

Line Token List				
LINE 0	VAR (FRED)	OPERATOR (=)	CONSTANT (5)	
LINE 1	STATEMENT (IF)	VAR (BOB)	OPERATOR (<)	CONSTANT (5)
LINE 2	VAR (BOB)	OPERATOR (=)	VAR (FRED)	OPERATOR (+) CONSTANT(3)

Figure 5: The WINCMD interpreter uses a list of pointers like this one to execute its programs.

BOB, the data for that entry simply contains the string "BOB".

The first item in the line token list for the second line is a keyword, so the interpreter calls the routine pointed to by the IF entry in the variable list. The IF routine then evaluates the items in the line token list that make up the condition on the line following the IF. Depending on the result of the evaluation, this line may or may not be executed. In the Figure 5 example, the variable BOB is still assigned the string "BOB", so its numeric value is 0. Since 0 is less than 5, the line following the IF statement is executed.

The third line of this program, like the first, is a simple assignment statement. The items beyond the equal sign are evaluated and in this case FRED is 5, so the result is 5 + 3 or 8. When the interpreter tries to execute the line after the last assignment, it sees the end-of-file token, meaning the program has finished.

Calling a predefined function is similar to processing a keyword. Function names are listed in the variable list, along with the keywords and variables. As with keywords, predefined functions each have a pointer in the variable list that points to the WINCMD.EXE subroutine that executes the function. Thus, executing a function is simply a matter of parsing its parameters and calling the routine that executes it.

ADDING LIBRARY FUNCTIONS Since functions are simply items in the variable list, it's fairly easy for libraries such as WCLIB to add functions. They are simply added to the variable list. When WINCMD.EXE is launched, it looks for files with a .WCL extension in its directory, and if any are found, LoadLibrary is called to load the file as a DLL. If the load is successful and the .WCL DLL has external entry points named WCLibLoad and WCLibFunc, it is assumed to be a WINCMD function library. The DLL

WCLibLoad routine is called immediately so the library can perform any initialization processing necessary, and the WCLibFunc entry point is saved in WINCMD.EXE. Later, when a function from the library is called, the WCLibEntry point is called to execute the function.

When the interpreter is reset, a third entry point, WCLibReset, is called. The library then uses a callback function in WINCMD.EXE to add entries to the WINCMD variable list. These entries include the name of the function and numbers that indicate the source DLL of the function and a function number. The interpreter uses these numbers to determine which DLL to call when the function is called in a WINCMD program.

When the WCLibFunc routine in WCLIB is called, it uses the function number passed with the call to look up a pointer for the proper function to call inside the DLL. The WCLibFunc call also includes a pointer to a callback entry point in WINCMD.EXE. This allows libraries such as WCLIB to call routines that manipulate entries in the variable list. The callback is necessary because multiple instances of WINCMD.EXE may be running at any one time. The callback allows the single instance of the WCLIB DLL to operate on the correct variable list each time it is called.

Fortunately, the user need not appreciate the complex interaction between WINCMD.EXE and WCLIB. Together they provide a powerful command language that can be used to control your Windows desktop. And the fact that WINCMD can be extended with additional libraries makes its language an ever-evolving process. Who knows? There may be another WINCMD function library sometime in the future! □

DOUGLAS BOLING IS A CONTRIBUTING EDITOR TO PC MAGAZINE.

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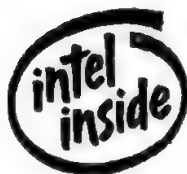
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The Path to Advanced Font Techniques

BY CHARLES PETZOLD

I've been talking about how to use fonts under the OS/2 Presentation Manager for a number of issues now, and it's time to digress briefly for a discussion of *paths*. As you'll see, paths open up additional techniques for working with OS/2 outline fonts.

If you've done any graphics programming in PostScript, you probably already know about paths. It's almost impossible to draw at all under PostScript unless you use them. The OS/2 GPI (Graphics Programming Interface) also supports paths, and though you don't have to use them for most drawing, they can be quite useful for advanced graphics programming.

WHAT IS A PATH? Let's begin the discussion with a few definitions. A *path* is a collection of straight-line and curve definitions that is stored internally in GPI memory. Some of these lines may be connected to each other. If so, these connected lines are known collectively as a *subpath* or a *figure*.

Thus, a path is composed of one or more subpaths, and each subpath is a collection of connected lines.

A subpath can be either *closed* or *open*. A subpath is closed if the end of the last line is connected to the beginning of the first line in the subpath. (A special function is available to close a subpath.) Otherwise, the subpath is open.

CREATING A PATH To create a path in your presentation space, you first call the following function:

```
GpiBeginPath (hps, lPath);
```

Although the *lPath* parameter is documented as a path ID, in fact it must be set to 1.

The *GpiBeginPath* function marks the beginning of a *path bracket*. After *GpiBe-*

ginPath is called, only a limited number of GPI functions are allowed in the path bracket. (The complete list is contained in the *Presentation Manager Programming Reference*.) Specifically, you can call functions that draw lines and set line attributes, plus a few that do other things. The lines are not actually drawn at this point, but are instead stored in GPI memory as the path definition.

The reason paths are an important

*When you have an
outline font selected
into the presentation
space, paths are
the key to
using text output
functions.*

tool when using outline fonts is that if you have an outline font selected in the presentation space, then text output functions such as *GpiCharStringAt* are also allowed within the path bracket. In this case, the character outlines become part of the path definition.

To make a closed subpath, you need to call

```
GpiCloseFigure (hps);
```

after drawing the lines that comprise the subpath, even if you've made the end point of the last line the same as the begin point of the first line. And if you haven't made these two points the same, *GpiCloseFigure* will close the path with a straight line between the two points. If

you don't call *GpiCloseFigure*, the subpath will be open.

The *GpiCloseFigure* function also begins a new subpath. You can begin a new subpath by calling *GpiMove* or another function—such as changing a transform—that otherwise changes the current position.

To end a path bracket you call

```
GpiEndPath (hps);
```

At this point, the entire path definition is stored in GPI memory and things are back to normal. But you'll probably want to use the path soon after creating it by calling one of the special path functions. These functions are

- *GpiOutlinePath*
- *GpiStrokePath*
- *GpiFillPath*
- *GpiSetClipPath*
- *GpiPathToRegion*

Each of these functions does something with the path and then deletes it from storage. (There is no explicit path deletion function.) Note that prior to calling one of these five functions you can call *GpiModifyPath*, which I'll discuss toward the end of this column.

Many of the path functions—such as *GpiBeginPath*—require an *lPath* parameter, and in all cases it must be set to 1. There's a historical explanation for this. Back in the early days of PM development, the GPI specification allowed a program to create and store multiple paths in the presentation space. These paths could then be combined in various ways. However, the complexity of this, together with marketing pressures to release OS/2 1.1 by October, 1988, caused the concept to be abandoned. Only one path can be stored in the presentation space. The function syntax was left open, though, to allow later enhancements.

ENDJOIN.MAK

Complete Listing

```

#-----
# ENDJOIN.MAK make file
#-----

endjoin.exe : endjoin.obj olfdemo.obj olfdemo.def
             link386 /BASE:0x10000 endjoin olfdemo,, NUL,, olfdemo

endjoin.obj : endjoin.c
             gcc -C -Kbcpr -Ss endjoin.c

olfdemo.obj : olfdemo.c
             gcc -C -Kbcpr -Ss olfdemo.c

```



Figure 1: The ENDJOIN.MAK file constructs ENDJOIN.EXE from the component source code files.

OUTLINING THE PATH The simplest function that does something with a path is

```
GpiOutlinePath (hps, lPath,
               lOption);
```

As with GpiBeginPath, the lPath parameter must be set to 1. Also, the lOption parameter must be set to 0. This function simply renders the path on an output device (such as the video display) by drawing it as a series of lines. It then deletes the path definition from memory.

But why bother? Why not just draw the lines to begin with instead of storing them in a path definition and then calling GpiOutlinePath?

In most cases, the effects *are* exactly the same, and there is no real reason to

use the path. The GpiOutlinePath function was actually far more important in OS/2 1.1 when you could not specify the FATTR_SEL_OUTLINE attribute in the FATTRS structure you pass to the GpiCreateLogFont function. The path was the only way you could draw outlined (rather than filled) characters using an outline font. But even with the addition of the FATTR_SEL_OUTLINE attrib-

ute, GpiOutlinePath still has a unique purpose when it is used in conjunction with the GpiModifyPath function, as we shall see. When you draw lines using the line-drawing functions, or when you display a font created either with the FATTR_SEL_OUTLINE function or by calling GpiOutlinePath, the lines have certain attributes. First, there is the *line type*, which you set using the GpiSetLineType function. The line type determines whether lines are solid (which is the default) or are composed of various dots and dashes.

Second, the lines have a width, governed by use of the function

```
GpiSetLineWidth (hps, fxWidth);
```

The function's second parameter is a fixed-point value, with the high word being an integer part and the low word being a fractional part. The default, whose identifier is LINEWIDTH_NORMAL, is the value 0x00010000. This represents a line width that is considered "normal" for the particular output device. On video displays, for example, the normal width is one pixel. You can also use LINEWIDTH_THICK (the value 0x00020000) to double the width of the lines. These are the only two values that are guaranteed to yield unique results, and indeed are the only values that work on a VGA.

The width of these lines is independent of any transforms that may be in effect. If you use a transform that doubles the sizes of all graphics objects, for example, the line widths are not affected. This is known as the "cosmetic" line width, to differentiate it from the "geometric" line width, which I'll discuss next.

STROKING THE PATH The second function that renders a path is

```
GpiStrokePath (hps, lPath,
               lOption);
```

As with the GpiOutlinePath function, the lPath parameter must be set to 1 and the lOption parameter must be set to 0.

Like the GpiOutlinePath function, GpiStrokePath renders the path on an output device by drawing it as a series of lines. However, GpiStrokePath draws

ENDJOIN.C

Complete Listing

```

/*-----
ENDJOIN.C -- Geometric Line Ends and Joins
(c) Charles Petzold, 1993
-----*/

#define INCL_WIN
#define INCL_GPI
#include <os2.h>

void DrawFigure (HPS hps, int i, SHORT cxClient, SHORT cyClient)
{
    POINTL ptl;

    ptl.x = (1 + 10 * i) * cxClient / 30;
    ptl.y = 3 * cyClient / 4;
    GpiMove (hps, &ptl);

    ptl.x = (5 + 10 * i) * cxClient / 30;
    ptl.y = cyClient / 4;
    GpiLine (hps, &ptl);

    ptl.x = (9 + 10 * i) * cxClient / 30;
    ptl.y = 3 * cyClient / 4;
    GpiLine (hps, &ptl);
}

void PaintClient (HPS hps, SHORT cxClient, SHORT cyClient)
{

```

```

static LONG alJoin [] = { LINEJOIN_BEVEL, LINEJOIN_ROUND, LINEJOIN_MITRE },
alEnd [] = { LINEEND_FLAT, LINEEND_SQUARE, LINEEND_ROUND };
int i;

for (i = 0; i < 3; i++)
{
    // Draw the geometric line

    GpiSetLineJoin (hps, alJoin [i]);
    GpiSetLineEnd (hps, alEnd [i]);
    GpiSetLineWidthGeom (hps, cxClient / 20);
    GpiSetPattern (hps, PATSYM_HALFTONE);

    GpiBeginPath (hps, 1);
    DrawFigure (hps, i, cxClient, cyClient);
    GpiEndPath (hps);

    GpiStrokePath (hps, 1, 0);

    // Draw the cosmetic line

    GpiSetLineWidth (hps, LINEWIDTH_THICK);

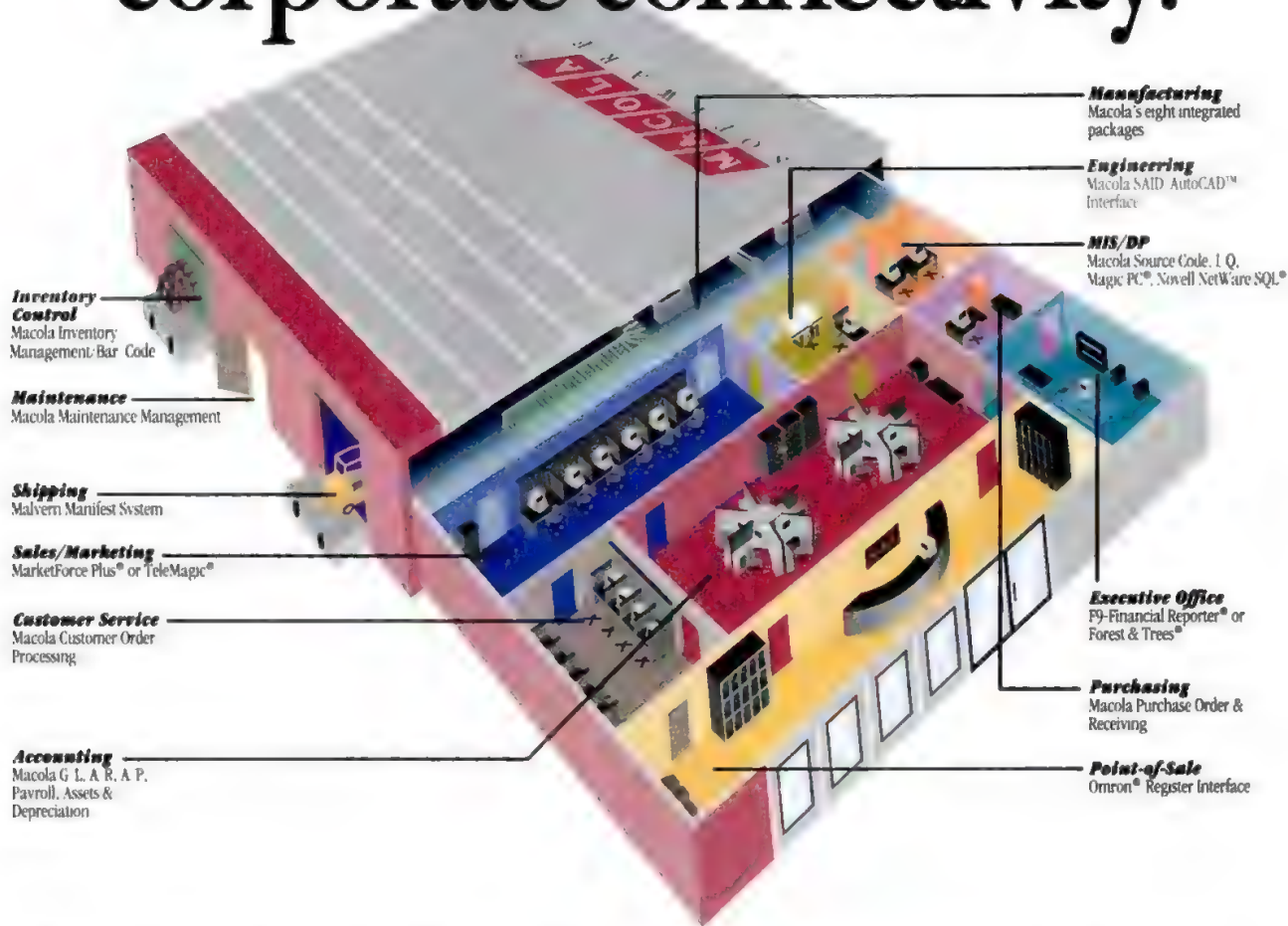
    DrawFigure (hps, i, cxClient, cyClient);
}
}

```



Figure 2: The ENDJOIN.C file draws lines with various end and join options.

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"geometric" lines rather than "cosmetic" lines. These geometric lines are not affected by the `GpiSetLineType` or the `GpiSetLineWidth` functions. Instead, the width of the lines is governed by the following function:

```
GpiSetLineWidthGeom (hps, lWidth) ;
```

The `lWidth` parameter is the desired line width in world coordinates. Thus, the geometric line width is dependent on any transforms that may be in effect. The lines are actually treated as filled areas and are filled with the current area-filling pattern, which you set using the `GpiSetPattern` function.

COSMETIC AND GEOMETRIC LINES The distinction between cosmetic and geometric lines is something I had never encountered before I began to explore GPI in pre-beta versions of OS/2 1.1, in the fall of 1987. (The concept will also show up in Windows NT.) But this distinction makes a lot of sense.

The example I like to use is this: Suppose you use lines to create an architectural drawing. You'll probably want to use geometric lines for the walls of the structure, because these should appear larger when you "zoom in" on the image. However, the lines that indicate the measurements of the structure should be cosmetic lines—there is no reason for them to thicken when you zoom in.

One reason why paths are very important is that you simply can't draw geometric lines otherwise! And this, of course, is what immediately provokes the question: Why not?

Once you begin drawing geometric

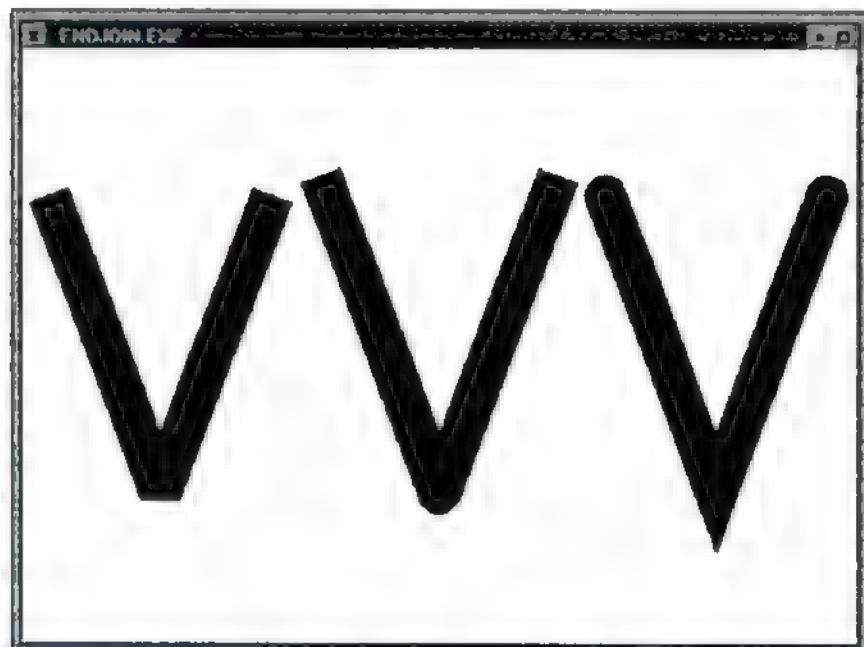


Figure 3: The ENDJOIN display shows the three different types of line ends and joins.

PATHS.MAK

Complete Listing

```
#-----
# PATHS.MAK make file
#-----

paths.exe : paths.obj olfdemo.obj olfdemo.def
            link386 /BASE:0x10000 paths olfdemo,, NUL,, olfdemo

paths.obj : paths.c
            gcc -C -Kbcpr -Ss paths.c

olfdemo.obj : olfdemo.c
            gcc -C -Kbcpr -Ss olfdemo.c
```



Figure 4: The PATHS.MAK file constructs PATHS.EXE from the component source code files.

lines that have a very thick width (say, over a quarter of an inch or so), then the "ends" and "joins" of these lines become visually important. When drawing geometric lines using the `GpiStrokePath` function, two other line-drawing attribute functions play a part. The first is

```
GpiSetLineEnd (hps, lEnd) ;
```

The `lEnd` parameter can be `LINEEND_FLAT` (which is the default), `LINEEND_SQUARE`, or `LINEEND_ROUND`. This affects the beginning of the first line and the end of the last line in an open path. (It does not affect a closed path at all.) With `LINEEND_FLAT`, the end of the line is cut off flatly. With `LINEEND_SQUARE`, the end of the line is also flat, but it is extended by half the width of the line. With `LINEEND_ROUND`, the end of the line is capped off with a semicircular area.

When two lines within a subpath are joined, the appearance of the join is governed by

```
GpiSetLineJoin (hps, lJoin)
```

where `lJoin` can be either `LINEJOIN_BEVEL` (the default), `LINEJOIN_ROUND`, or `LINEJOIN_MITRE`. (Notice that the British spelling of "miter" reveals the origins of the GPI in the IBM labs in Hursley, England.) The miter join comes to a point; the bevel join has the point chopped off; and the round join is, of course, round.

Explanations are one thing,

and visuals are another. So let's look at the short ENDJOIN program, shown in Figures 1 and 2, which uses geometric lines to illustrate the three types of ends and joins. You can compile this program if you have the IBM C Developer's WorkSet/2 installed, using the command line:

```
NMAKE ENDJOIN.MAK
```

You can also download the source code and executable files from the Programming Forum on PC MagNet, archived as ENDJOI.ZIP. Although this program doesn't use outline fonts, it requires the OLFDEMO files presented here in the April 27, 1993, issue for the normal PM overhead.

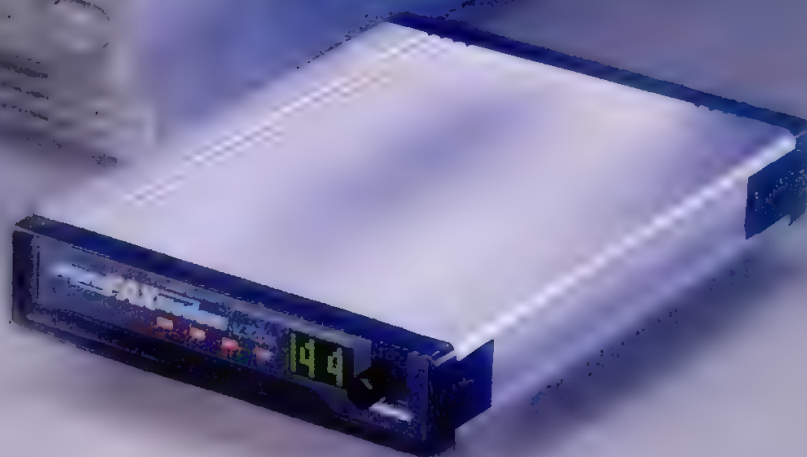
As shown in Figure 3, ENDJOIN.EXE draws three sets of lines that illustrate (from left to right) the flat, square, and round line ends, and the bevel, round, and miter line joins.

For each of the three figures, the program draws two lines using the same coordinates: one, a wide geometric line with a 50 percent dense pattern, and the other a cosmetic line using a thick (that is, double) width. This illustrates how the ends and joins correspond to the actual geometric ends of the lines. Notice in particular how the square and round ends extend past the actual end of the line, unlike the flat end.

This brings me back to answering the question of why paths are required for drawing geometric lines. The answer is that GPI cannot properly determine if two lines are joined unless the connected lines are accumulated in a path before being drawn. For example, if GPI receives

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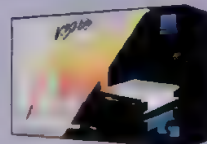


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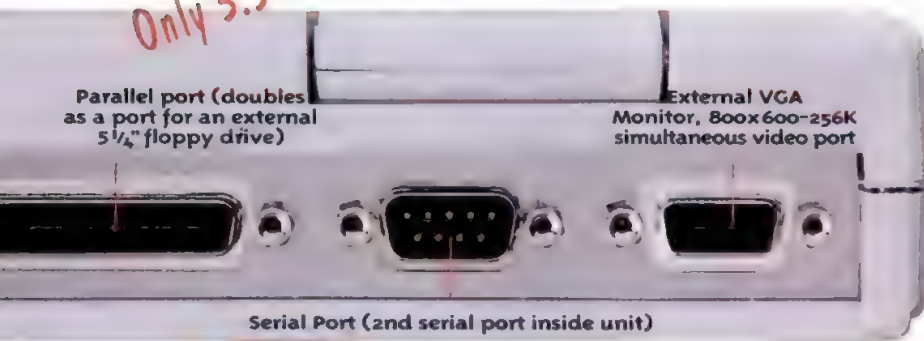
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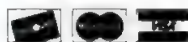
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PATHS.C

Complete Listing

```

/*-----
PATHS.C -- Path Operations
(c) Charles Petzold, 1993
-----*/

#define INCL_WIN
#define INCL_GPI
#include <os2.h>

void PaintClient (HPS hps, SHORT cxClient, SHORT cyClient)
{
    int    x, y ;
    POINTL ptl ;

    for (x = 0 ; x < 3 ; x++)
        for (y = 0 ; y < 2 ; y++)
        {
            // Create an open sub-path

            GpiBeginPath (hps, 1) ;

            ptl.x = (1 + 10 * x) * cxClient / 30 ;
            ptl.y = (4 + 5 * y) * cyClient / 10 ;
            GpiMove (hps, &ptl) ;

            ptl.x = (5 + 10 * x) * cxClient / 30 ;
            ptl.y = (2 + 5 * y) * cyClient / 10 ;
            GpiLine (hps, &ptl) ;

            ptl.x = (9 + 10 * x) * cxClient / 30 ;
            ptl.y = (4 + 5 * y) * cyClient / 10 ;
            GpiLine (hps, &ptl) ;

            // Create a closed sub-path

            ptl.x = (1 + 10 * x) * cxClient / 30 ;
            ptl.y = (3 + 5 * y) * cyClient / 10 ;

            GpiMove (hps, &ptl) ;

            ptl.x = (5 + 10 * x) * cxClient / 30 ;
            ptl.y = (1 + 5 * y) * cyClient / 10 ;
            GpiLine (hps, &ptl) ;

            GpiCloseFigure (hps) ;
            GpiEndPath (hps) ;

            // Possibly modify the path

            if (y == 0)
            {
                GpiSetLineWidthGeom (hps, cxClient / 30) ;
                GpiModifyPath (hps, 1, MPATH_STROKE) ;
            }

            // Perform the operation

            GpiSetLineWidth (hps, LINEWIDTH_THICK) ;
            GpiSetLineWidthGeom (hps, cxClient / 50) ;
            GpiSetPattern (hps, PATSYM_HALFTONE) ;

            switch (x)
            {
                case 0: GpiOutlinePath (hps, 1, 0) ; break ;
                case 1: GpiStrokePath (hps, 1, 0) ; break ;
                case 2: GpiFillPath (hps, 1, FPATH_ALTERNATE) ; break ;
            }
        }
}

```



Figure 5: The PATHS.C file draws figures with various path operations.

a GpiLine call, it has to draw the selected line-end design at the end of the line, even though another GpiLine call may follow it, which would indicate a line-join design.

FILLING THE PATH So far, we've examined outlining a path (using cosmetic lines) and stroking a path (using geometric lines). You can also fill path interiors by using the function

```
GpiFillPath (hps, lPath, lOption) ;
```

As usual, the lPath parameter is 1. This function closes all open subpaths with straight lines. The interiors of the subpaths are filled using the current area-filling pattern.

The lOption parameter can be either FPATH_ALTERNATE (the default if you specify a 0 parameter) or FPATH_WINDING. This determines how sub-path interiors are filled if they overlap, as follows.

- For alternate-fill mode, an interior is not filled if an imaginary line drawn from the interior to infinity crosses an even number of boundaries. Otherwise, the interior is filled.
- For winding-fill mode, an interior is not

filled if an imaginary line that has been drawn from the interior to infinity crosses the same number of boundary lines drawn in one direction as drawn in the opposite direction. Otherwise, the interior is filled.

Although GPI has functions that can fill arbitrarily defined areas by using an area bracket (GpiBeginArea and GpiEndArea) rather than a path, text output functions are not allowed in area brackets. With paths, you can fill characters with nonsolid patterns, such as hatchmarks.

Two functions that have a syntax similar to that of GpiFillPath are

```
GpiSetClipPath (hps, lPath,
lOption) ;
```

where the lOption parameter can be either SCP_ALTERNATE or SCP_WINDING, and

```
hRgn = GpiPathToRegion (hps, lPath,
lOption) ;
```

where the lOption parameter may be either FPATH_ALTERNATE or FPATH_WINDING.

The GpiSetClipPath function causes GPI to clip all drawing to the interior of the path. Thus, text characters can define a clipping area and produce some interesting effects (as we'll see in the next installment of this column). The GpiPathToRegion function converts the path to a GPI region and returns a handle to the region.

MODIFYING THE PATH So far we've examined five functions you can call after creating a path. These functions can outline the path with a cosmetic line, stroke it with a geometric line, fill it, make it into a clipping area, or convert the path into a region. Each of these functions deletes the path from GPI memory after completing its operation.

After calling GpiEndPath and before calling one of the five functions discussed above, you can also call the following function:

```
GpiModifyPath (hps, lPath, lMode) ;
```

The lPath parameter must be 1, and lMode must be MPATH_STROKE.

This function creates a new path from the old path. To visualize what it does, think of the path as being stroked by a

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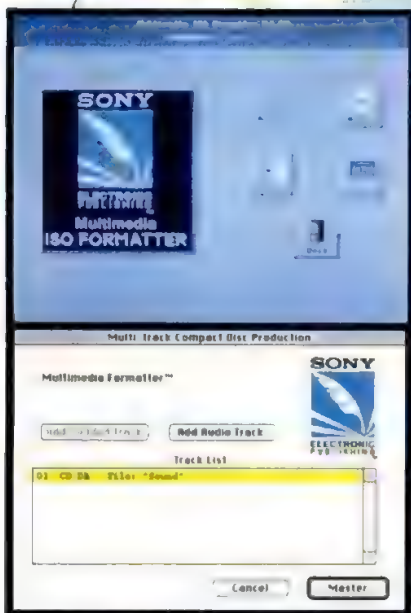
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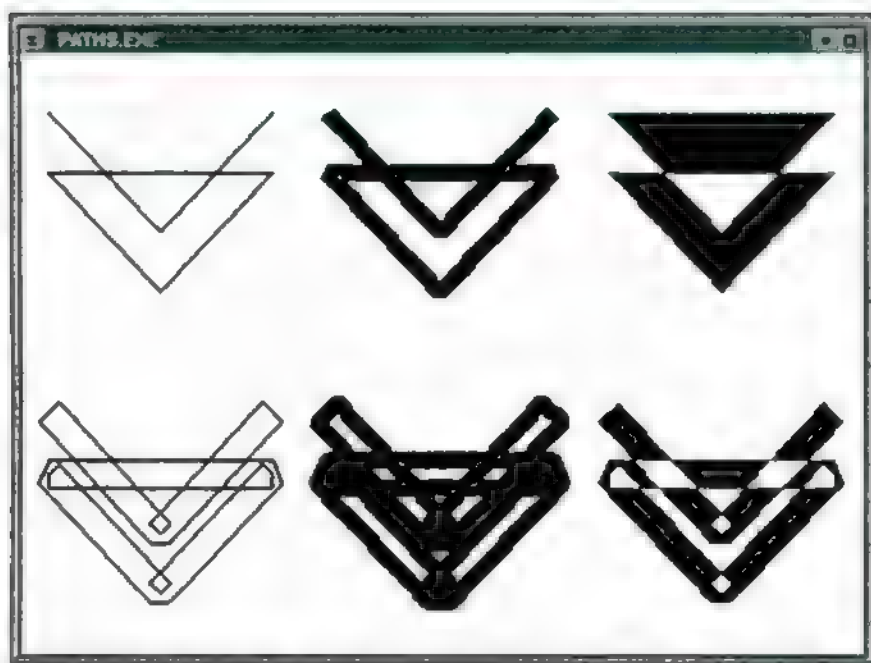


Figure 6: The PATHS display shows the various path operations.

geometric line. The new path is the outline of that thick line. Every open path is converted into a closed path, and every closed path is converted into two closed paths.

The PATHS program shown in Figures 4 and 5 illustrates combinations of modifying, outlining, stroking, and filling. (This is available from the Programming Forum on PC MagNet, archived as PATHS.ZIP). The program creates a

width of the client area. The results are displayed in Figure 6.

The two outlined paths on the left side of Figure 6 show most clearly the effects of GpiModifyPath. The open v-shaped subpath is converted into a closed subpath that outlines the path as if it had been stroked with a geometric pen. The closed triangle subpath is converted into two paths, one on the outside and one on the inside of the outlines of a geometric

path six times. The path contains an open subpath (a V shape) and a closed subpath (a triangle). From left to right at the top of the display, the program outlines the path using a double-width cosmetic pen, strokes the path with a geometric pen that is $\frac{1}{50}$ the width of the client area, and fills the path. Both the stroking and filling use the halftone area-fill pattern. Along the bottom these three operations are preceded by modifying the path with a geometric pen $\frac{1}{30}$ the

pen stroking. Of course, the little interior loops at the apexes look rather odd, but they are the results of the algorithm GPI uses.

THE PATH AND FONT CONNECTION As I mentioned at the outset, when an outline font has been selected into the presentation space, text-drawing functions are allowed within a path bracket. The outlines of the characters become part of the path. As we shall see next time, this opens up new potentials in creating special effects with outline fonts.

There is, however, one important caveat: In OS/2 2.0 (as in earlier versions), a path definition is limited to a 64K segment. What?! And you thought a 32-bit operating system didn't have to worry about segments? Well, much of GPI was not initially converted to 32-bit. This is something that is supposed to be fixed in OS/2 2.1.

Meanwhile, using paths with fonts can sometimes overrun that 64K limit, and the path will not be created. It's something to watch out for when you're experimenting. □

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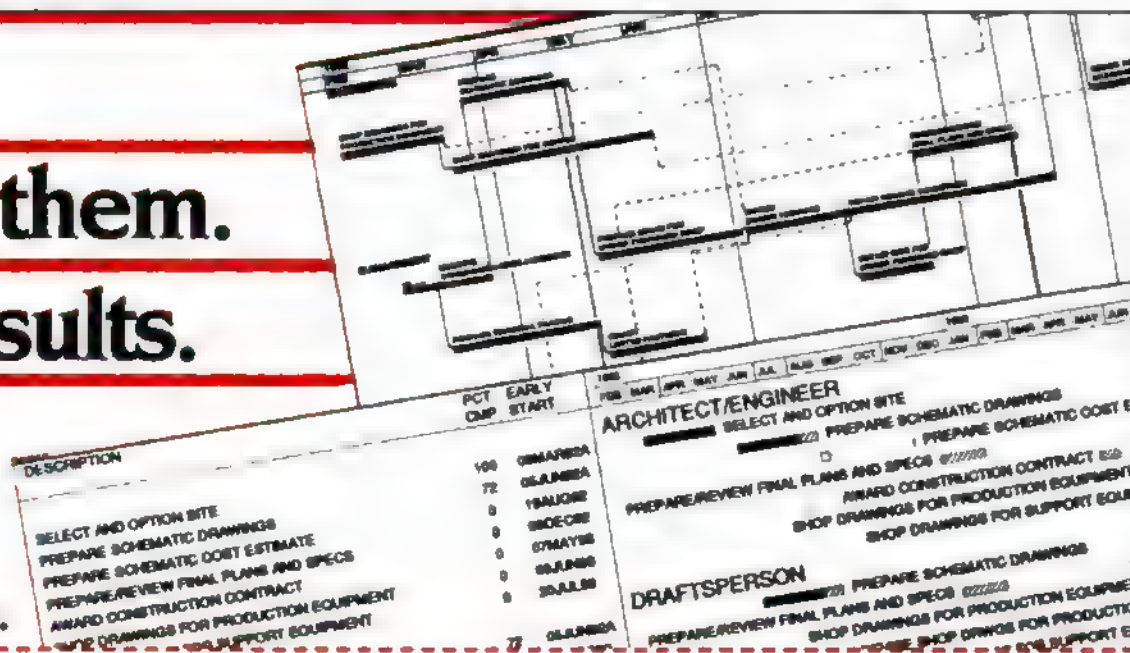
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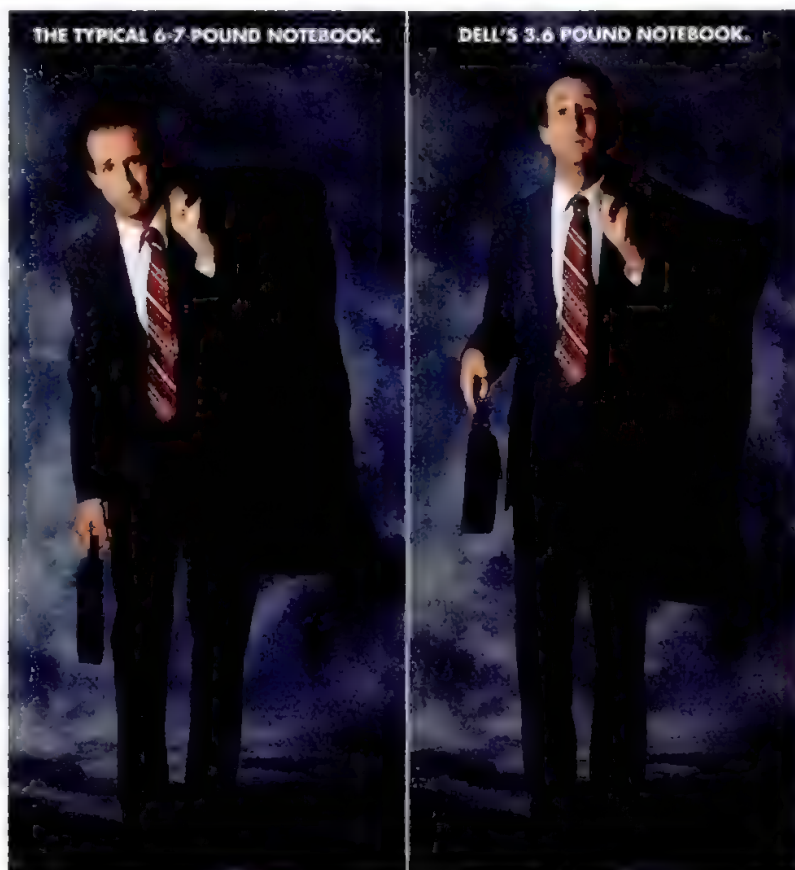
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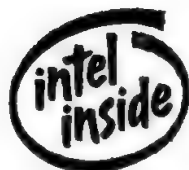


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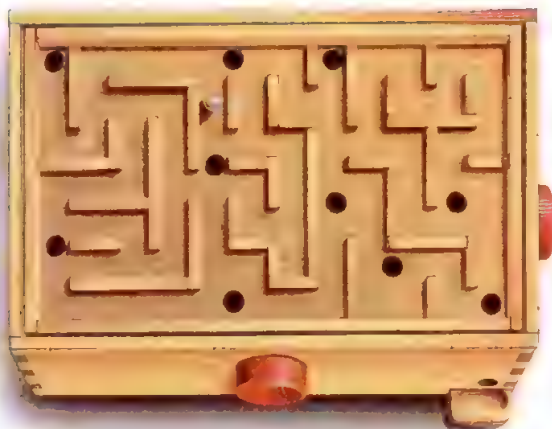
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Integrating a Windows Help File Into an Application

BY RAY DUNCAN

In the last two columns, we've looked at the process of designing and implementing a simple Windows help file, using the EXELOOK utility from previous Power Programming columns as an example. In this installment, we'll discuss integrating a help file into an application.

DESIGNING A HELP MENU Unlike designing the contents of your help file, designing the help pop-up on the menu bar for your application is no trouble at all. Microsoft's *Windows Interface: Application Design Guide* manual spells out quite clearly which items should appear on an application's help menu, how they should be arranged, and which accelerator keys they should use. If you follow these guidelines, your application will behave like all the other "compliant" Windows applications with regard to on-line help, and the end user will be able to access the help file without thinking twice—which, after all, is one of the main goals of a GUI.

As defined by Microsoft, a pop-up help menu should be triggered by the menu title "Help," which should lie at the right end of the menu bar. The pop-up menu should use Alt-H as the accelerator key and should contain, at minimum, the following four items:

- Contents—activates the help-file viewer and displays the application help file's table of contents,
- Search for Help on...—activates the help-file viewer and displays the Search for Keyword dialog box,
- How to Use Help—activates the help-file viewer and displays the table of contents for the WINHELP.HLP file, and
- About <application-name>—displays a dialog box containing the application name, version number, copyright message, icon, and so forth.

Other help menu items, such as shortcuts to frequently used topics in the help file, can be placed between the Search for... and How to... menu items. Interestingly, of the three most important Microsoft "productivity" products for Windows (Word, Excel, and PowerPoint), only one—PowerPoint—follows the help menu recommendations found in Microsoft's own Application Design Guide.

At any rate, incorporation of a simple help-menu pop-up into your applica-

*Constructing a Windows
help file may not be
easy, but designing the
help-menu pop-up and
incorporating it into
your application is
no trouble at all.*

tion's main menu resource is a fairly straightforward process. The first step is to use #define statements in order to declare identifiers in your application's header file for each of the four items listed above. By convention, these identifiers are given names of the form IDM_xxx, although you can really name them anything you like. The value of each identifier that is used in a particular menu must be unique for that menu so that you can pick them apart when you are processing a WM_COMMAND message; the values have no other significance. For example, we might add the following declarations to our EXELOOK.H header file:

```
#define IDM_HELPCONTENTS 100
#define IDM_HELPSEARCH 101
#define IDM_HELPONHELP 102
#define IDM_HELPABOUT 103
```

Next, add the actual text for the items in the help-menu pop-up to the menu template in the application's resource script (RC) file, along with the associated identifiers and the accelerator key designators. The menu template for EXELOOK, modified to include the help-menu pop-up, is shown in Figure 1, and a screen dump of the actual displayed menu is shown in Figure 2.

APPLICATION INTEGRATION The key to hooking a help file into your application is a single Windows API function named WinHelp(). The prototype for the WinHelp() function is:

```
BOOL WinHelp(HWND hwnd, LPSTR
    lpszHelpFile, UINT fuCommand,
    DWORD dwData)
```

In other words, the parameters to WinHelp() are a handle for an application window, a far pointer to an ASCII pathname for the help file to be displayed, an action or "command" code, and an additional doubleword of data whose meaning depends on the command code. The value returned by WinHelp() is a Boolean flag which is true if the function was successful and false if it failed. A summary of the WinHelp() command codes and the corresponding doubleword values is shown in Figure 3. The list is surprisingly long, but in order to implement the Microsoft-recommended minimum help menu, we need only four of the command codes: HELP_CONTENTS, HELP_PARTIALKEY, HELP_HELPONHELP, and HELP_QUIT.

The first step toward integrating a

EXELOOK MENU TEMPLATE

Complete Listing

```

ExeLookMenu MENU
BEGIN
  POPUP "&File"
  BEGIN
    MENUITEM "&Open", IDM_OPEN
    MENUITEM "E&xit", IDM_EXIT
  END
  POPUP "&Display"
  BEGIN
    MENUITEM "DOS (&MZ) Header", IDM_DOSHDR
    MENUITEM "COFF &File Header", IDM_COFFHDR
    MENUITEM "COFF &Optional Header", IDM_OPTHDR
    MENUITEM "&Data Directory", IDM_DATADIR
    MENUITEM "&Sections", IDM_SECT
    MENUITEM "&Imports", IDM_IMPORT
    MENUITEM "&Exports", IDM_EXPORT
    MENUITEM "&Resources", IDM_RESOURCE
    MENUITEM "Resource &Tree", IDM_RSRTREE
  END
  POPUP "&Help"
  BEGIN
    MENUITEM "&Contents", IDM_HELPCONTENTS
    MENUITEM "&Search for Help on...", IDM_HELPSEARCH
    MENUITEM "&How to Use Help", IDM_HELPONHELP
    MENUITEM SEPARATOR
    MENUITEM "&About ExeLook...", IDM_HELPABOUT
  END
END

```



Figure 1: This is EXELOOK's menu template from the application's resource file. It includes the statements that describe the pop-up help menu.

help file into your application is to write the code for the Help—Contents menu item. As you'll recall, the user's selection of this menu item will result in a WM_COMMAND message to the frame window with the IDM_xxx identifier value you assigned to the menu item in the menu resource script. For EXELOOK, the message will have a wParam value of IDM_HELPCONTENTS. The application responds to this message by calling WinHelp() with the command HELP_CONTENTS and with a pointer to the name of the application's help file.

WinHelp() launches the help-file viewer WINHELP.EXE (that is, if it's not already running) and causes it to display the topic whose context string (label) is specified with the CONTENTS= command in the [OPTIONS] section of the HPJ file that was used to build the help file.

The second step is to implement the Help—Search for Help on... menu item. This is accomplished as a call to WinHelp() with the command HELP_PARTIALKEY, a pointer to the name of the application's help file, and a pointer to a null string as the doubleword data item. This causes the help viewer to

launch and immediately display the Search dialog box that is ordinarily activated by the Search button on the WINHELP button bar. Our EXELOOK help file has not yet evolved to where this works correctly, however, so we'll return to this issue in a moment.

The third step is to install the code for the Help—How to Use Help menu item. This code is simply a call to WinHelp() with the HELP_HELPONHELP command and the name of the help viewer's own help file (WINHELP.HLP). Don't succumb to the temptation to "improve" the viewer's help file by writing your own; it's important that all users come to the same resting place from the Help—How to Use Help menu item in every application. Also, there's no reason for you to have to update the

help information for the viewer each time a new release of Windows appears if Microsoft will do the work for you.

The last step is to add code to the application to shut down the help viewer when the application exits so that the viewer will not be left behind cluttering up the screen with the application's help file after the user has moved on. The necessary code, which consists only of a call to the WinHelp() function with the command HELP_QUIT, needs to be placed in the mainstream of the application's clean-up-and-terminate sequence so that it can never be bypassed accidentally. The logical place to put the code is in the processing of the WM_CLOSE message for the frame window. Make sure that the File-Exit menu item is implemented as a SendMessage() of WM_CLOSE.

No harm is done if you call WinHelp() with the command HELP_QUIT when the viewer has already been dismissed by its own File-Exit menu item or, for that matter, if the viewer was never launched in the first place. From this, it seems pretty clear that the WinHelp() function does little more than call the LoadModule() function and send messages to the viewer once it is running. Presumably, the viewer uses the window handle passed to WinHelp() in order to track how many applications are using it at the same time, so that it can resist a HELP_QUIT notification from one application if other applications that have invoked it are still running. Unfortunately, the viewer doesn't seem to make

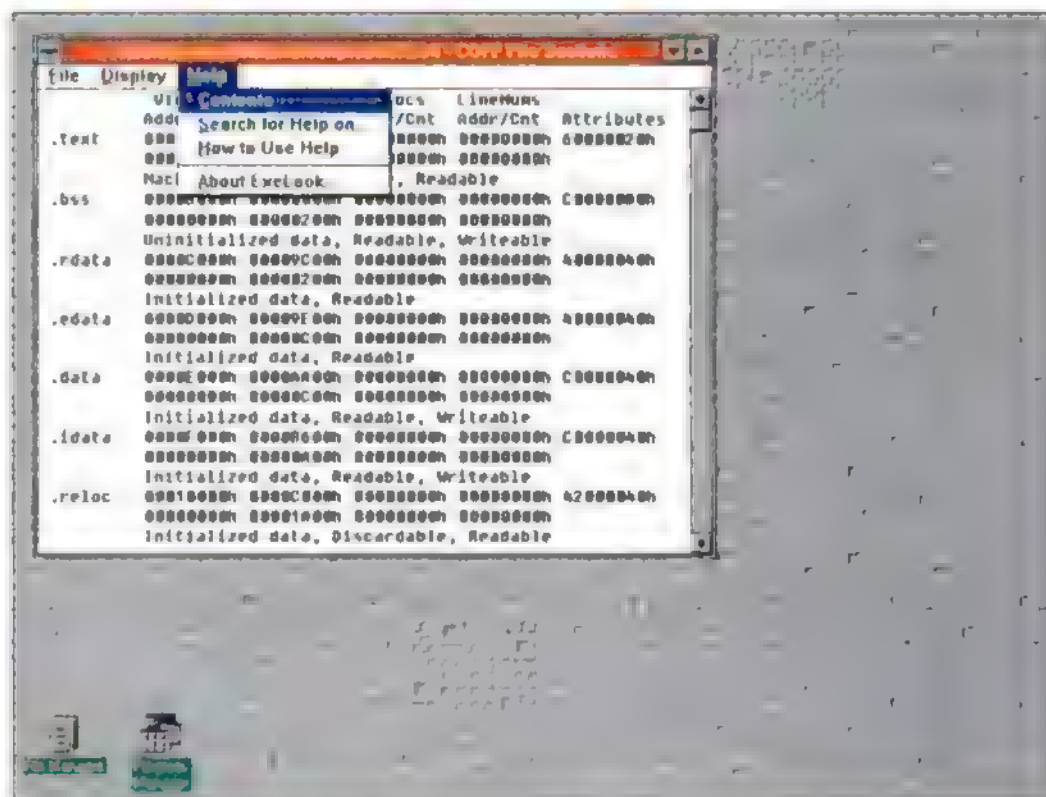


Figure 2: The EXELOOK program in action, showing the pop-up help menu designed according to Microsoft's guidelines.

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FILE
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INFO
HELP

Customer Profiler

File Data Information Help

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Net Income Per Share	2.4	2.3	2.2	2.1
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any other use of the window handle; for example, it doesn't automatically change the currently displayed help file according to which application has the focus.

Once you've carried out these four modifications to your program, compile the program and try out the linkage to the help viewer, making sure that the viewer is activated correctly in response to the help pop-up menu and that it shuts down appropriately when your application exits. A simplified extract of the source code for EXELOOK related to help menu message processing is shown

*If you want to provide
the end user with a
search capability in your
help file, you have to
manually, painstakingly
attach a keyword footnote
to each topic.*

in Figure 4. (EXELOOK is an NT program, but this particular code is identical in Win16 and Win32 environments). You'll notice right away that the Help—Search for Help on... menu item doesn't work as expected. In fact, the help viewer immediately displays a dialog box with the inexplicable error message "Help file does not contain keywords," and then reverts to the table of contents for the help file.

KEYWORDS AND TITLES The reason the help viewer doesn't want to display its search dialog for the EXELOOK.HLP file is that we haven't yet defined any keywords in the file. The sad truth is that in spite of the help viewer's apparent sophistication and the immense convenience of its "search" feature, the help viewer is totally incapable of searching through the contents of a help topic for anything at all. If you want to provide the end user with a search capability in your help file, you have to manually, painstakingly, attach to each topic a keyword footnote that contains all of the words that should be indexed and searchable

Help File Command Codes		
fuCommand	dwData	Action
HELP_CONTEXT	Topic context number	Displays help for a topic identified by a context number defined in the [MAP] section of the .HPJ file.
HELP_CONTENTS	Ignored	Displays the help contents topic defined by the CONTENTS= statement in the [OPTIONS] section of the .HPJ file.
HELP_SETCONTENTS	Topic context number	Determines which Contents topic help should display when a user presses the F1 key.
HELP_CONTEXTPOPOP	Topic context number	Displays Help in a pop-up window for a topic identified by a context number defined in the [MAP] section of the .HPJ file.
HELP_KEY	Far pointer to an ASCIIZ topic keyword	Displays the topic that matches the specified keyword if there is one exact match. If there is more than one match, displays the Search dialog box with the topics listed in the Go To list box.
HELP_PARTIALKEY	Far pointer to an ASCIIZ topic keyword.	Displays the topic that matches the specified keyword if there is one exact match. If there is more than one match, displays the Search dialog box with the topics listed in the Go To list box. If there is no match, displays the Search dialog box. To bring up just the Search dialog box, pass a pointer to a null string.
HELP_MULTIKEY	Far pointer to a MULTIKEYHELP structure specifying a table footnote character and a keyword	Displays the help topic identified by a keyword in an alternate keyword table
HELP_COMMAND	Far pointer to an ASCIIZ macro	Executes a Help macro.
HELP_SETWINPOS	Far pointer to a HELPWININFO structure specifying the size and position of a help window	Displays and positions the Help window as specified in the structure.
HELP_FORCEFILE	Ignored	Ensures that WinHelp is displaying the correct help file. If the correct help file is currently displayed, no action is taken. If the incorrect help file is displayed, WinHelp opens the correct file.
HELP_HELPONHELP	Ignored	Displays the Contents topic of the designated Using Help file.
HELP_QUIT	Ignored	Closes the help viewer, providing no other applications are also using the viewer.

Figure 3: Command codes and associated double-word data items for the WinHelp() API function.

within that topic.

To create a keyword footnote for a particular topic, first scroll to the beginning of the topic, where you should already have a # footnote containing the context string (label) that serves as the target of hyperlinks to that topic. Next to the # character, insert another footnote using the character K (which must be capitalized) as the footnote indicator. In the body of the footnote, type one or more

keywords separated by semicolons. If necessary, a topic can have more than one K footnote to make enough room for all the keywords.

But wait, there's more! In order for searching to work properly, you must also add, for each topic, yet another kind of footnote that contains a "title" for that topic. Title footnotes use the \$ character as an indicator, and the contents of the title footnote are displayed as the repre-



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EXELOOK.C

Partial Listing

```

// Extracts from the source code for EXELOOK.EXE, a utility
// to display information about an NT "Portable EXE" (PE) File
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// PC Magazine * Ziff Davis Publishing

#define IDM_HELPCONTENTS 100
#define IDM_HELPSEARCH 101
#define IDM_HELPONHELP 102
#define IDM_HELPABOUT 103
.
.
.

TCHAR szHelpFileName = "ExeLook.hlp";
.
.
.

//
// Table of window messages supported by FrameWndProc()
// and the functions which correspond to each message.
//
struct decodeMsg frameMsgs[] = {
    WM_PAINT, DoPaint,
    WM_SIZE, DoSize,
    WM_COMMAND, DoCommand,
    WM_CLOSE, DoClose,
    WM_INITMENU, DoInitMenu,
    WM_DESTROY, DoDestroy,
    WM_VSCROLL, DoVScroll, } ;

//
// Table of WM_COMMAND menu IDs and their corresponding functions.
//
struct decodeMsg menuMsgs[] = {
    IDM_OPEN, DoMenuOpen,
    IDM_EXIT, DoMenuExit,
    IDM_DOSHDR, DoDisplayType,
    IDM_COFFHDR, DoDisplayType,
    IDM_OPTHDR, DoDisplayType,
    IDM_DATADIR, DoDisplayType,
    IDM_SECT, DoDisplayType,
    IDM_IMPORT, DoDisplayType,
    IDM_EXPORT, DoDisplayType,
    IDM_RESOURCE, DoDisplayType,
    IDM_RSRCRTREE, DoDisplayType,
    IDM_HELPCONTENTS, DoMenuHelpContents,
    IDM_HELPSEARCH, DoMenuHelpSearch,
    IDM_HELPONHELP, DoMenuHelpHelp,
    IDM_HELPABOUT, DoMenuHelpAbout, } ;

.
.
.

//
// FrameWndProc --- callback function for application frame window.
// Searches frameMsgs[] for message match, runs corresponding function.
//
LONG CALLBACK FrameWndProc(HWND hwnd, UINT wMsg, UINT wParam, LONG lParam)
{
    INT i; // scratch variable

    for(i = 0; i < dim(frameMsgs); i++) // decode window message and
    { // run corresponding function
        if(wMsg == frameMsgs[i].Code)
            return((*frameMsgs[i].Fxn)(hwnd, wMsg, wParam, lParam));
    }

    return(DefWindowProc(hwnd, wMsg, wParam, lParam));
}

//
// DoCommand -- process WM_COMMAND message for frame window by
// decoding the menubar item with the menuMsgs[] array, then
// running the corresponding function to process the command.
//
LONG DoCommand(HWND hwnd, UINT wMsg, UINT wParam, LONG lParam)
{
    INT i; // scratch variable

    for(i = 0; i < dim(menuMsgs); i++) // decode menu command and
    { // run corresponding function
        if(wParam == menuMsgs[i].Code)
            return((*menuMsgs[i].Fxn)(hwnd, wMsg, wParam, lParam));
    }

    return(DefWindowProc(hwnd, wMsg, wParam, lParam));
}

return(DefWindowProc(hwnd, wMsg, wParam, lParam));
}

//
// DoMenuExit -- process File-Exit command from menu bar.
//
LONG DoMenuExit(HWND hwnd, UINT wMsg, UINT wParam, LONG lParam)
{
    SendMessage(hwnd, WM_CLOSE, 0, 0); // send close message
    return(FALSE); // to shut down the app
}

//
// DoClose -- process WM_CLOSE message for frame window.
//
LONG DoClose(HWND hwnd, UINT wMsg, UINT wParam, LONG lParam)
{
    // save filename, window size, window position
    UpdateProfile();

    // shut down help file viewer if running
    WinHelp(hwnd, szHelpFileName, HELP_QUIT, 0);

    // destroy the frame window
    DestroyWindow(hwnd);
    return(FALSE);
}

//
// DoMenuHelpContents -- process Help-Contents command from menu bar.
//
LONG DoMenuHelpContents(
    HWND hwnd, UINT wMsg, UINT wParam, LONG lParam)
{
    WinHelp(hwnd, szHelpFileName, HELP_INDEX, 0);
    return(FALSE);
}

//
// DoMenuHelpSearch -- process Help-Search for... command from menu bar.
//
LONG DoMenuHelpSearch(HWND hwnd, UINT wMsg, UINT wParam, LONG lParam)
{
    WinHelp(hwnd, szHelpFileName, HELP_PARTIALKEY, (LONG) (LPSTR) "");
    return(FALSE);
}

//
// DoMenuHelpHelp -- process Help-How to Use Help command from menu bar.
//
LONG DoMenuHelpHelp(HWND hwnd, UINT wMsg, UINT wParam, LONG lParam)
{
    WinHelp(hwnd, "WINHELP.HLP", HELP_HELPONHELP, 0);
    return(FALSE);
}

//
// DoMenuHelpAbout -- process Help-About command from menu bar.
//
LONG DoMenuHelpAbout(HWND hwnd, UINT wMsg, UINT wParam, LONG lParam)
{
    // display the somewhat useless about dialog, then return;
    // in Windows NT we don't need the MakeProcInstance() call
    DialogBox(hInst, "AboutBox", hwnd, (WNDPROC)
    AboutDlgProc);
    return(FALSE);
}

//
// AboutDlgProc -- callback routine for About... dialog. Basically
// ignores all messages except for the OK button, which dismisses dialog.
//
BOOL CALLBACK AboutDlgProc (HWND hwnd, UINT msg, UINT wParam, LONG lParam)
{
    if((msg == WM_COMMAND) && (wParam == IDOK))
        EndDialog(hwnd, 0); // if OK button, destroy dialog
    else return(FALSE); // otherwise ignore message
}

```

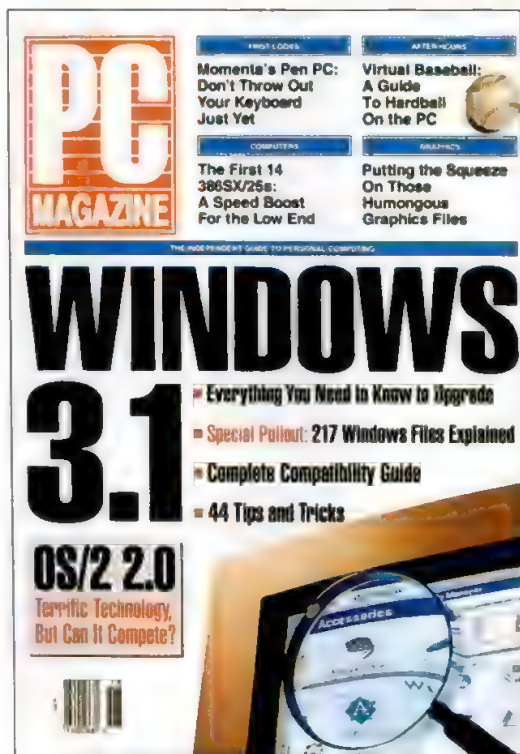
Figure 4: This extract of the source code for EXELOOK.EXE shows the code related to the processing of messages for the pop-up help menu.

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MultiLabel	MLABEL.ZIP	WYSIWYG label designer uses Windows fonts with bold, italic, bold italic, and reverse type. Imports clip art and has built-in line, box, and circle drawing.	PBSAPPS Lib 7 Windows Applications
GRFBK Hypertext Publishing Tool	GRFBK.ZIP	Mix ASCII text and .PCX graphics on the same page! Instant page jumps and unique "dynamic links" allow readers to search and browse in any direction.	PBSAPPS Lib 6 DOS Applications
Paint Shop Pro	PSPRO.ZIP	Windows screen capture system features image editing and file conversion.	PBSAPPS Lib 8 Graphics
PKZIP & PKUNZIP Ver. 2.04G	PK204G.EXE	Improved compression and multi-volume archive support/formatting. Can "span" a .ZIP file across multiple diskettes and format destination diskettes on the fly.	PBSAPPS Lib 3 DOS Utilities
Video Poker Tutor	VPTUTR.ZIP	Video poker game calculates odds for each hand and indicates playing errors.	PBSARC Lib 3 DOS Games
WINPOST	WINPST.ZIP	Post-It notes for Windows. Keep up to 32 notes stuck here and there.	PBSAPPS Lib 7 Windows Apps.
True Type Fonts Parts 1 and 2	TTF1.ZIP & TTF2.ZIP	18 TrueType fonts for Windows 3.1. Includes are Garamond, Chancery, Eurotype, and more.	PBSAPPS Lib 8 Graphics
KILO-BLASTER	KILO.ZIP	Fast-action arcade game reminiscent of Galaxian. Features digitized and ray-traced backgrounds in 256-color VGA.	PBSARC Lib 3 DOS Games
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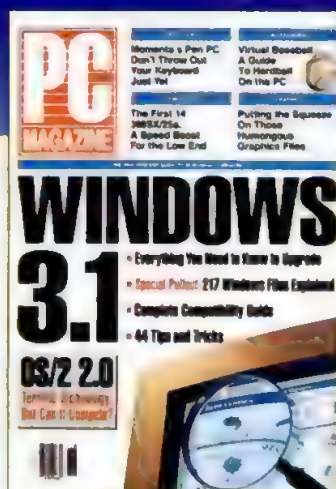
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POWER PROGRAMMING

sentative for a topic in the Go To window of the help viewer's search dialog as well as in the viewer's History window. "Now just a doggone minute," you're probably saying to yourself, "all of my help-file topics already have perfectly good titles that are elegantly formatted as part of the help text itself."

That's correct, as far as it goes, but it brings us back to the same issue we uncovered with the Search for Help on... menu item, namely: the help-file viewer

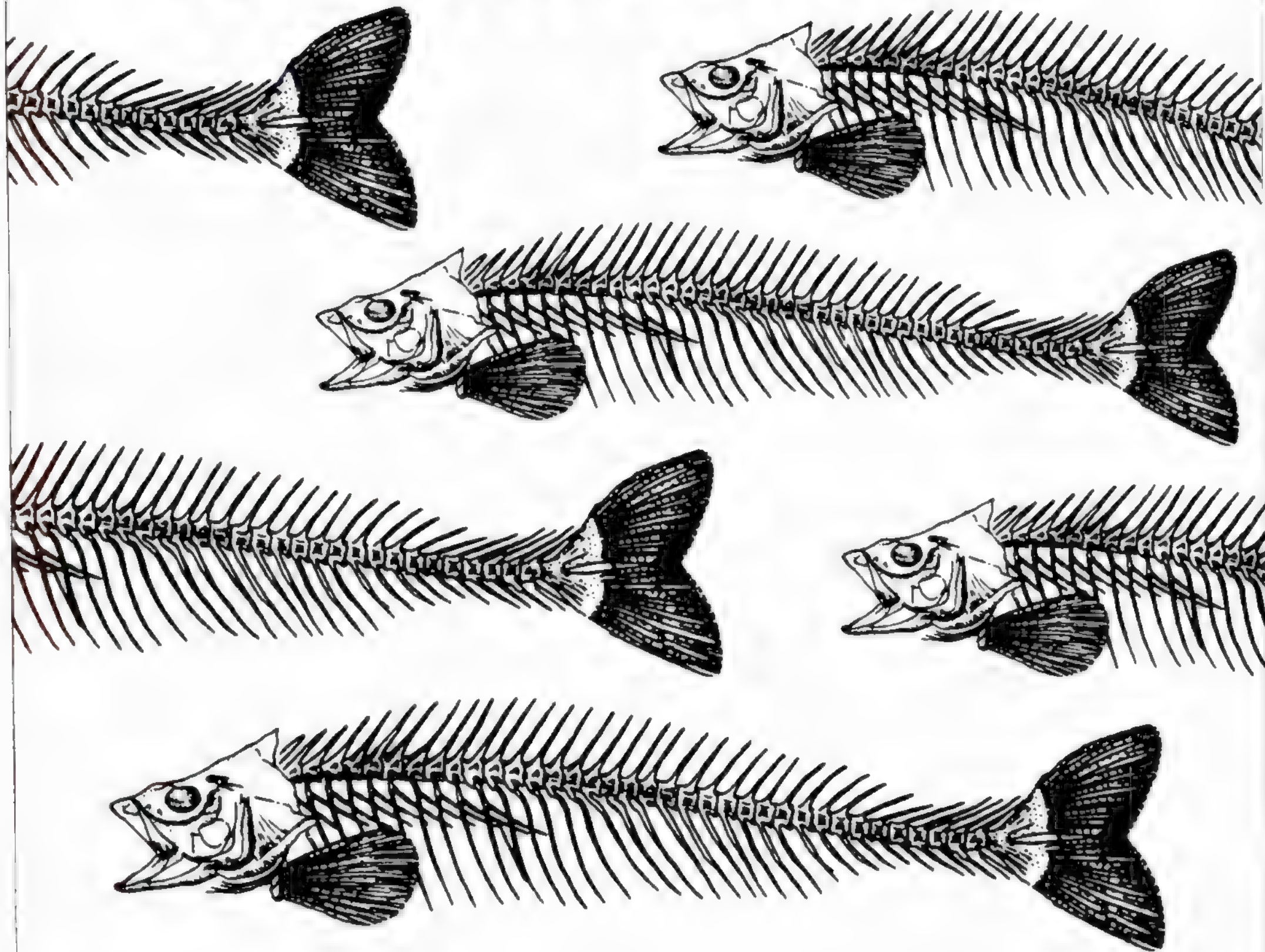
*The help file viewer knows
how to format and display
help topics within a
scrollable, resizable
window, but it doesn't
know how to interpret that
text in any other way.*

knows how to format and display the text of help topics within a scrollable, resizable window, but it doesn't know how to interpret that text in any other way. In most cases, you can simply copy and paste the topic's actual title into the title footnote, but it is aggravating and seems like a task that ought to be taken care of automatically by the help compiler or help viewer (with, of course, an override option for those rare occasions where the help-file author needs to specify a different title than the one that is displayed as part of the help text).

All of the files necessary to build EXELOOK.EXE and EXELOOP.HLP can be downloaded from the Programming forum on PC MagNet. Look for the files archived as EXELOOK.ZIP and EXEHLP.ZIP. In the next issue, we'll talk about more exotic help-file features such as pop-up windows, secondary windows, bitmaps, and macros.

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MISSING MEMORY?

❗ My new 486DX, PC-compatible clone has 8MB of RAM, yet the power-on self-test counts up to only 7,808K instead of 8,192K. I realize that the missing 384K is the same size as the upper memory area, and I assume that the problem is not caused by a bad chip since the memory passes all sorts of diagnostic tests. I even tried disabling the BIOS shadow feature, but the memory is still missing. Why can't I use this memory?

Larry C. Berger
Palmerton, Pennsylvania

► **PC MAGAZINE:** Your computer is probably working just as it was designed to, and you may not be able to get at that missing 384K.

You're right about the size of the upper memory block—it's the portion of a DOS system's memory map between the first 640K (used by DOS as conventional memory) and the end of the first megabyte (where extended memory begins.) The problem is that your computer's hardware is configured in such a way that it cannot recognize the RAM in that segment.

This is a fairly common situation for PC-compatible systems. If you use the DOS 5.0 MEM command to display information for an 8MB system, you will often find "655360 bytes total conventional memory" and "7340032 bytes total contiguous extended memory." Divide these by 1,024 (the number of bytes in one kilobyte) and you'll get 640K and 7,168K, or 7,808K in all. Add the missing 384K and you get 8,192K, or 8MB since there are 1,024K in one megabyte.

There are a number of reasons why this memory is set aside, but the most common is that the computer uses it to store the system's BIOS. The ROM chips used for the BIOS code have the advantage of retaining their contents when the power is turned off, but they are slow

Our Advisors

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Luisa Simoes is a contributing editor and the author of the book *Microsoft Publisher*.

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M. David Stone is a contributing editor and coauthor of *Word for Windows Companion*, Second Edition.

Ethan Winer is a contributing editor and the author of *PC Magazine BASIC Techniques and Utilities*.

compared with dynamic RAM. Copying the contents of ROM into RAM makes BIOS calls much faster.

In some cases, you can disable the BIOS shadow feature and recover the "lost" memory, but there are some motherboard designs that will not return the memory even when you disable shadowing. You may still be able to use this missing memory, though. Some system chip-

sets can set aside RAM to shadow the entire contents of the upper memory block, which includes system and video BIOS. This is similar to the way that memory management utilities map extended memory into portions of the upper memory block so you can load DOS drivers and TSRs into this "high" memory. Quarterdeck's QEMM-386 is able to recognize the presence of some of these chip sets and use this "shadow" memory directly without having to use any additional extended memory. You can check with Quarterdeck (310-392-9851) to see if your computer's chip set is supported.

If disabling shadowing doesn't help you regain the memory, and a memory management program like QEMM-386 can't find the missing memory, then you're probably not going to be able to use it.

It's interesting to note that the problem of "missing memory" is nothing new. When 80286 AT-class clones first appeared, they frequently came with motherboards that would hold a full megabyte of RAM. The BIOS would give you two choices of how to configure this memory: You could have 640K system memory and nothing else, or you could have 512K system memory and 512K extended memory. Since most users required the full 640K to run their applications, this meant they had to choose the first option, losing access to 384K in the process.

—Alfred Poor

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Peripherals

ABSENT BITS

❓ I have a dot matrix printer with a parallel connection to my PC. When I print, the characters on the left side of my keyboard print correctly, but those on the right print as garbage. Characters are substituted so that the DOS prompt A> comes out as A6. What's wrong, and how can I fix it?

Barbara Alejandre
Waxahachie, Texas

► **PC MAGAZINE:** While it may appear that your printer has been possessed by demons, the answer most likely lies in your printer cable or its connections.

The two most common connections for peripherals on PCs are parallel and serial, and their names describe how they work. Serial connections send the data in series, one bit after another, which is why it's so important to get timing and format issues straight at both ends of the connection—baud rate, word length, stop bits, and so on. The advantage of this system is that you can get by with as few as two wires between the devices (though most serial connections use at least five).

Parallel ports are much simpler. They operate at a single rate and send all eight bits of a byte at one time. That is, all bits arrive at the receiving end in parallel. This approach requires eight wires just for the data (one for each bit), but the payoff comes in the ease of installation and in the fast transmission of data.

There's also a big difference between parallel and serial connections in terms of what happens when there is a bad connection. If the signal wire in a serial connection isn't connected, no data gets across. If one of the parallel connections goes bad, however, the remaining seven signal wires can keep working. I suspect this is the cause of your problem.

Here are the binary codes for the characters in question:

Character	ASCII (decimal)	ASCII (binary)
A	65	1000001
>	62	0111110
6	54	0110110

Note that A has a 0 bit in the fourth digit (from the left) in binary format. The > has a 1 in this column, but the 6 has a 0. The substitution is most likely caused by a faulty connection on this wire; if this wire is not connected, the printer will interpret the signal as a 6 instead of the intended >.

Ms. Alejandre didn't provide any other substitution examples, but if M (binary 1001101) comes out as E (binary 1000101) it would provide strong support for this theory. The fact that the characters on the left side of the keyboard printed correctly while those on the right were garbled does offer another clue. Here's a list of characters in keyboard order that have a 1 in the fourth digit:

```
89 -=\
Y IO {}
HJKL:
ZX NM<>?~
```

As you can see, all the problem characters (except Z and X) are on the right side!

The solution? First, try reseating the cable at both ends. If that doesn't work, try a new cable (one with a maximum

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length of 6 feet). Parallel signals are not very strong, and the specified limit for standard cables is 12 feet; a cable close to this limit could be the source of the trouble. If a new cable doesn't solve the problem, then try the computer with a different printer, or the printer with a different computer, to see if you can find a combination that works. This will help determine which device has the problem. If it's the computer, you may be able to get an inexpensive expansion card to replace the parallel port. If it's the printer, you'll probably need to have it repaired.—*Alfred Poor*

Operating Environments

A STRANGE MEMORY LOSS

❓ A strange problem occurred on four 286 clones running MS-DOS 5.0. When we first installed DOS 5.0, the machines showed 640K of conventional memory. After a few months, they began to show only 638K. If you booted from a floppy disk you'd see 640K again, but copying the system files and COMMAND.COM

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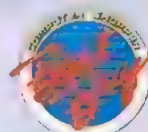
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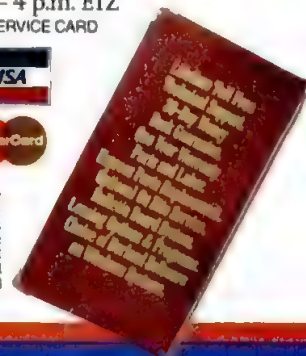
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from the floppy disk to the hard disk had no effect. In desperation, I ran FDISK /MBR, rebooted, and—lo and behold—we had 640K of memory again.

I used DEBUG to copy the boot record to a file before and after the fix, but running COMP to compare the files showed no differences. This fix worked on all four machines. Can you tell us what might have caused the problem, and what FDISK did to correct it?

David A. Riegert
Sparks, Nevada

► **PC MAGAZINE:** I may have some bad news for you. The characteristics you describe precisely match the symptoms of infection by a virus that attacks the *master boot record*. This record resides in the very first physical sector of a hard disk, along with the master partition table. When the system boots, the master boot record gets control first. Then it transfers control to the boot sector of the active partition, using information from the par-

*A boot record virus can't be
detected by looking for
changes in a particular
partition's boot sector.*

tition table. A virus that infects the master boot record can't be detected by looking for changes in a particular partition's boot sector. The fact that booting from a floppy disk prevented the memory loss suggests some kind of boot sector virus, and the FDISK /MBR cure strongly points to a master boot record virus. (The undocumented /MBR switch for FDISK simply re-creates a disk's master boot record, with the salutary effect of eliminating any master boot record virus.)

Several viruses of this type produce a memory loss similar to the one you describe. A boot sector virus loads itself into memory before the regular boot-up process, so the memory it occupies seems to disappear. Inserting an unprotected floppy disk into the machine is an invitation for the virus to infect it. When another machine is booted with an infected floppy disk in the drive, whether it's a

bootable disk or not, the virus can spread to the other machine's hard disk.

The fact that you removed the infestation from four particular machines with FDISK /MBR does *not* mean you're safe now. You need to get a virus scanning program and test any floppy disks that were in contact with the suspect machine, as well as any other machines that were in contact with those disks. If a single infested floppy disk remains, there's a chance for the infection to spread again.

Viruses aren't as common as the media would have you believe. Still, when the symptoms so clearly point to a virus infestation, it's better to be safe than sorry.—Neil J. Rubenking

PASSWORD PROTECTION IN WINDOWS

✓ **TIP** I liked Paul Thomsen's ideas on using the built-in Windows screen savers (User-to-User, October 13, 1992). I have a suggestion of my own.

There's a quick and easy way to password-protect Windows either on demand or at Windows startup. Windows .SCR screen-saver files are really just special forms of .EXE programs. As Mr. Thomsen noted, you can copy an .SCR file to an .EXE to let it be run like a program. But there's an even easier way, and it uses up less disk space. Just add SCR to the Programs= key in the [Windows] section of WIN.INI, so that it now reads COMEXE BAT PIF SCR. You'll have to restart Windows so it will reread the new WIN.INI before this change will take effect.

Now select one of the screen savers included with Windows 3.1, and set it up to require a password. The SSMARQUE .SCR saver works well for this, with the scrolling message set to "Enter Password." Next, create a ProgMan item for the SSMARQUE.SCR file, including the /S switch on the command line:

```
C:\WINDOWS\SSMARQUE.SCR /S
```

Double-clicking on this item invokes the Marquee screen saver with its password protection enabled!

As an additional measure of security, you can set Windows to be password-protected on startup just by putting this new

icon in the Startup group. The nice thing about this method is that Marquee does *not* have to be set up as your permanent screen saver in Control Panel. It allows you to protect your system at specific times, without having to enter the password whenever the screen saver kicks in.

The only drawback I've encountered is that some programs refuse to launch an .SCR file as a program. Alas, my favorite Windows shell, Launch (by David Stafford) is one of these.

John Colletti
Southfield, Michigan

► **PC MAGAZINE:** Indeed adding SCR to the list of extensions that Windows regards as programs is a better solution than giving the .EXE extension to a copy of a screen-saver file. You can bypass the Control Panel entirely by creating *two* program items for your selected screen saver, one with /S on its command line and one without. The item without the /S will invoke the screen saver's setup dialog, allowing you to change the password and set any options specific to the screen saver.

Putting a screen saver in the Startup group gives fairly effective password protection: Windows executes the Startup programs from left to right, so in order to have the screen saver execute first, it should be in the top left corner of the Startup group window.

You may also want to assign a shortcut key to the program item that runs your screen saver. Any time Program Manager is the active application, you can trigger the screen saver just by pressing the shortcut key. If you've created a shortcut key for ProgMan itself, invoking the screen saver can be even simpler. The December 22, 1992, Solutions column explained how to assign a ProgMan shortcut key. In brief:

- Create a program item for PROGRAM.EXE in the Startup group.
- Tab to the Shortcut key line in the Program Properties dialog and press the shortcut key you want to use (it must include at least two shift keys).

Now from any Windows-based application, you can get instant password protection just by pressing the ProgMan shortcut key followed by the screen-saver shortcut key.—Neil J. Rubenking



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Word Processing

PRINTING DIRECTLY FROM WINDOWS

TIP The Windows 3.1 File Manager includes a drag-and-drop printing feature that works in combination with the Print Manager. With Print Manager and File Manager both running, simply click on the filename in File Manager and then drag the document icon to drop it on the Print Manager Window or minimized icon.

Normally this feature works only with programs, such as WinWord 2.x, that provide the needed information for the Windows Registration database during program installation. However, you can add the information manually. WinWord 1.1 users, for example, can add drag-and-drop printing with the following steps:

First, run REGEDIT.EXE, the Registration Info Editor, which you'll find in your Windows directory. (You can run the program from either Program Manager or File Manager with the File Run command, entering REGEDIT as the command line.) The Registration Info Editor window will show you a list of all registered file types in the database. Choose Edit | Add File Type to open the Add File Type dialog box.

You can now enter the information for the registration database. Enter `MicrosoftWord1.1Document` (with no spaces) in the Identifier text box and `Microsoft Word 1.1 Document` (with spaces) in the File Type text box. The identifier is meant as a unique keyword in the database. The File Type is the name that will show on the list of registered file types. To define the action for printing, choose the Print button in the Action box and enter the command for starting WinWord in the Command text box. If the program is on drive D: in the WinWord directory, for example, enter the command as

`D:\WINWORD\WINWORD.EXE`

Next, make sure the Uses DDE check box is selected and enter the appropriate

information in the four text boxes in the DDE box. For Application, enter WinWord; for Topic, enter System; for DDE Message, enter

```
[FileOpen("%1")] [FilePrint()]
[FileClose()]
```

For DDE Application Not Running, enter

```
[FileOpen("%1")] [FilePrint()]
[FileExit()]
```

Choose OK to save the newly entered data and return to the Registration Info Editor main window. If you look through the list of registered file types at this point, you'll find the record you just added.

The next and final step is to associate the .DOC file extension with the file type you defined. Go to File Manager, choose File | Associate, then enter .DOC in the Files with Extension text box, and Microsoft Word 1.1 Document in the Associate With box. (Simply select it in the attached list box.) Choose OK to finish. You should now be able to print any WinWord .DOC file by dragging and dropping from within File Manager.

Binh Lam

North Hollywood, California

► **PC MAGAZINE:** The ability to print a file from File Manager with a single command—without having to manually load a program, load a file, give the print command, and then, finally, close the program—can be a useful convenience. It is, for example, well suited for a standard form that you have to print occasionally without any changes—such as directions for reaching your home or business.

More generally, you can simply *open* a file from File Manager. You can, for example, open a word processing file for editing by double-clicking on the filename, by selecting the filename and hitting Enter, or by selecting the filename and choosing File Open. You can also give the print command by selecting the filename and choosing File Print. And note that these techniques will work not just with Windows programs, but with DOS word processors (and other programs) as well, including the DOS ver-

sions of Microsoft Word and WordPerfect.

For this feature to work, File Manager has to have the right information on how to run the programs, and it has to know which program to run for any given file. The first prerequisite is relatively easy to take care of, as demonstrated in this tip. The second is trickier, since it requires discipline on your part.

The only way for File Manager to know which file goes with which program is through an association that pairs file extensions with specific programs, such as .DOC for WinWord or .SAM for Ami Pro. You can define these associations however you like—following the instructions given above—and even associate more than one extension with a program. Note, however, that you can associate any given extension with only one program.

If you prefer using descriptive extensions—such as .LET for letters and .MEM for memos—you'll have to be careful to stay with a predefined set of extensions that you've associated with your word processor. You'll also have to make sure you use different extensions for different programs. If you use the same extension for different programs, you'll have to decide which program to associate the extension with, and use this feature only for that program.

To make best use of these capabilities, it also helps to know a little about the Registration database—even if you use a program, such as Ami Pro 3.0 or WinWord 2.0, that automatically adds the information for you. The details vary from one program to another, so I'll touch only on some general pointers here.

First note that the Registration database simply stores the commands that File Manager uses when you give the command to Open or Print. Although it's not immediately obvious, you define each set of commands separately. To enter the commands to open a file, you choose the Open button in the Action box. To enter the commands to print, you choose the Print button. The dialog box will not change, but the two sets of commands are completely separate.

If you're entering information for a program that doesn't need or can't use DDE this way, such as a DOS program

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Word Processing...Spreadsheets

or WordPerfect for Windows, you need to enter the entire command in the Command text box along with any command switches, and make sure that the Uses DDE check box is not checked.

For example, the command to open a file with the DOS version of Word or the DOS or Windows version of WordPerfect would consist of the drive, path, and program name, followed by %1 to represent the selected file. This works because all three programs let you load a file on start-up by simply adding the file name to the command line.

The command for printing can be trickier for programs that won't take DDE commands, because not all programs have start-up options that will let you automatically print a file. (Ami Pro 3.0 users will note that the Ami Pro entry ignores DDE for printing in favor of using Ami Pro's built-in /p switch to automatically print the file that you designate on start-up.)

Note that neither the DOS nor Windows version of WordPerfect has a start-up print option, but both have a start-up option to automatically run a macro. You can simply record a macro for printing and add the macro switch to the command line. Given a macro named Print, with WordPerfect in the WP directory on drive C:, the entry for WordPerfect for DOS would be

```
C:\WP\WP.EXE %1 /m-print
```

Finally, WordPerfect for Windows users may want to bypass the Windows File Manager in favor of the WordPerfect File Manager. As you would expect, the File Print and File Open commands in the WordPerfect File Manager will work with WordPerfect for Windows without special tweaking.—*M. David Stone*

Spreadsheets

EXCEL PRINTING SETUP TIPS

Printing in Excel is for the most part a user-friendly endeavor, but we received several letters suggesting ways that can help make your Excel print jobs even smoother. The letters in this issue's Spreadsheets section focus on this topic.

TIP I like almost everything about Excel 4.0, except that it doesn't include a toolbar icon for the Page Setup command. In an attempt to fix this shortcoming, I wrote a simple macro and assigned it to a custom tool. The macro looks like this:

```
=PAGE.SETUP? ()  
=RETURN ()
```

To attach this to the toolbar, first save the macro (I put it on a sheet named C:\EXCEL\XLSTART\PGSETUP.XLM). Next, select Options | Toolbars | Customize, click on Custom, and select an icon for your new tool. Drag the chosen icon to the toolbar (you can put it on the end or anywhere within the toolbar). The Assign A Tool dialog box will appear, prompting you to assign a macro to the tool. Point to the page-setup macro, click OK, and click Close to dismiss the Customize dialog. Now every time you want to edit the page setup of a spreadsheet, simply click on the icon and the setup dialog will appear.

*Rusty Willey
Carthage, Illinois*

PC MAGAZINE: Any command on Excel's menu tree can be triggered with a simple macro like the one used by Mr. Willey. In most cases, if you put a question mark before the opening and closing parentheses, the macro just presents the menu command's dialog box, then pauses until you click OK or Cancel to dismiss the dialog.

Mr. Willey's strategy involves saving the macro in the XLSTART directory, then attaching it to a custom tool. The first step ensures that the macro sheet will always be in memory at the beginning of a new Excel session, but it has the drawback of adding to Excel's load time. If you leave the macro sheet unhidden, it also adds one more sheet to your desktop, making navigation between sheets a little clumsier than it would be otherwise.

You can eliminate the desktop clutter by hiding the .XLM file or by saving the file as an add-in macro and storing it in XLSTART. But if you're already using a global macro sheet, you might find it preferable to add the new macro to this

sheet. (If you're not sure whether you're using a global macro sheet, pull down the Window menu, choose Unhide, and see if Excel lists a sheet named GLOBAL.XLM.)

Alternatively, you can just let your macro sit out on-disk. When you click a custom tool, Excel first checks to see if the macro to which that tool is assigned is lurking anywhere in memory. If it's not, Excel fetches the disk file where the macro is stored. This "demand loading" approach is particularly efficient if you don't use your custom tool at every session. You'll have to wait a moment the first time you use the tool in a given session, but you'll reduce overhead when you don't need the tool.—*Craig Stinson*

TIP Figure 1 lists a little Excel macro that I wrote to overcome Excel's insistence that I go through the Page Setup dialog box every time I needed to change printers. You can either put the macro in your EXCEL\XLSTART directory or store it in the LIBRARY directory and reference it in your EXCEL4.INI file.

To reference it in your EXCEL4.INI, add the following entry under the [Microsoft Excel] heading:

```
Open#=C:\EXCEL\LIBRARY\PIKPRN.XLA
```

Replace the # symbol with the next available number in the list of Open commands.

Be sure to define the following names:

```
Auto_Open = $A$1  
ChoosePrinter = $A$9  
MenuItem = $A$7:$B$7
```

when you're creating this macro.

*Arek Pfeffer
Corona, California*

PC MAGAZINE: Not everything got easier in Excel 4.0. For some reason—perhaps to make room for the new Print Report command—Microsoft decided to eliminate the File menu's Printer Setup command. To switch printer drivers now, you first have to go to Page Setup (whether or not you want to change any page-setup parameters), then click the Printer Setup button. Mr. Pfeffer's simple macro restores the Printer Setup

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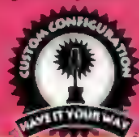
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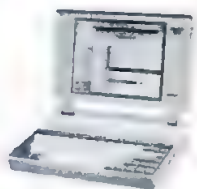
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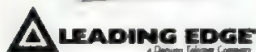
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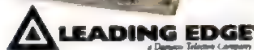
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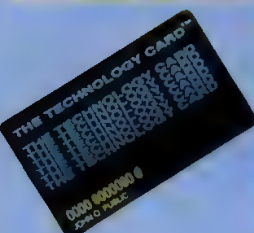
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Complete Listing

	A	B
1	Auto_Open	
2	=ADD.COMMAND(1,1,MenuItem,"Page Setup...")	
3	=ADD.COMMAND(2,1,MenuItem,"Page Setup...")	
4	=RETURN()	
5		
6	MenuItem	
7	P&rinter Setup...	=ChoosePrinter
8		
9	ChoosePrinter	
10	=PRINTER.SETUP?()	
11	=RETURN()	

Figure 1: This macro eliminates the need to go through the Page Setup dialog box in order to change printers.

command that Microsoft deleted.

Like Mr. Willey's Page Setup macro, this one looks like a good candidate for a custom tool. If you want to have the menu command as well as the custom tool, create and save the menu. Then customize your toolbar as Mr. Willey described and assign the new tool to the section of the macro named ChoosePrinter. If you just want the tool, without the extra menu command, you can put just the ChoosePrinter section on your macro sheet, omitting the Auto_Open and MenuItem sections. And in this case, you can also pursue a load-on-demand strategy, so you don't waste memory or clutter your desktop on days when you don't need to switch printers.—*Craig Stinson*

TIP A common way to clear an old print range in Excel is to select a new range and choose Set Print Area (on the Options menu). Another way is to use the Formula Define Name command and delete the name Print_Area. Actually, the way Microsoft apparently intended for us to accomplish the removal of a print area is to start by selecting the entire spreadsheet—by clicking the empty space at the intersection of the row numbers and column letters, in the top left corner of the window. When you do that, the Options menu's Set Print Area command changes to Remove Print Area, allowing you to get rid of the old print-area definition. Selecting the entire worksheet also lets you use Options-menu commands to remove print titles and page breaks.

Shane Devenshire
Walnut Creek, California

check box in the Options Display dialog. The only way to banish them seems to be to delete the print area. The second reason is that Excel prints the entire populated area of your worksheet by default—if you don't have a defined print area. So if you've just finished printing a particular range and want to go back to having Excel treat the entire worksheet as its print area, you first need to delete the defined print area.

As Mr. Devenshire has discovered, clicking the frame corner and choosing Options Remove Print Area is not the most intuitive procedure ever devised. If you have trouble remembering to do this, why not create the following two-line macro:

```
=DELETE.NAME("Print_Area")
=RETURN()
```

Then, following the instructions in Mr. Willey's letter, you can assign this snippet to a custom tool.—*Craig Stinson*

Databases

CHANGING USER PREFERENCES IN CLIPPER

TIP I develop custom Clipper applications for clients. During the first few months of any new project, the client's preferences for colors, function keys, printers, sounds, speed, window coordinates, shadows, and other things change constantly. Some of these settings are not particularly well-suited to alteration in

► **PC MAGAZINE:** Two common reasons exist why you might want to get rid of a defined print area. The first is to make those pesky dotted page-break lines go away. Excel displays its automatic page breaks (the ones it calculates itself, as opposed to breaks that you enter manually), regardless of how you set the Automatic Page Breaks

setup routines or configuration files.

With Clipper, each change forces a new edit-compile-link-reinstall cycle. This takes time and often cannot be done on the spot. My solution, at least until the application is truly stable, is to leave hooks for later patching by initializing in an indirect way those variables that are most likely to change.

For example, instead of using the standard method of initializing variables,

```
nVar = 15
cVar = "C:\MYDIR"
```

I use the following:

```
nVar = VAL(" 15 nVar")
* Leading spaces and
* text are ignored

cVar = ALLTRIM(" C:\MYDIR ")
* You could also
* use LTRIM(RTRIM())
```

Later, whenever I need to change the value of one of these variables, I search the .EXE file for the literal string using The Norton Utilities, PC Tools, or any other editor capable of handling binary files. I then make the change directly to the .EXE file.

It's best to leave a little space before and after the value in order to locate it more easily in a binary file and to make room for additional digits or characters.

Daniel A. Tobar
Madrid, Spain

► **PC MAGAZINE:** During the development stages of a project, frequent user-requested changes are an unavoidable fact of life. Since Clipper is a traditional two-pass compiler, having to recompile and link the entire application for every user change can be cumbersome indeed. If you're not afraid to edit a binary executable file directly, and if you're careful, you can make quick changes to user preference items stored in the executable without having to go through the compile/link cycle.

The trick to making this work is to create your variables indirectly, as Mr. Tobar suggests, so that you can easily locate the literal strings in the executable file. In Mr. Tobar's example, the line

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```
nVar = VAL(" 15 nVar")
```

is used to assign a value of 15 to the nVar numeric variable. This causes the literal string " 15 nVar" to be placed in the Clipper-compiled executable file, where it can easily be searched for and altered using a binary file editor. A simple assignment such as

```
nVar = 15
```

would leave no such trail, and so would be much more difficult to modify. Fortunately, Clipper's VAL() function ignores the trailing text in " 15 nVar", so you can identify your numeric variables by name and then search for the name using your binary editor.

Note that when you store path specifications this way, you must be careful to leave enough space for other values that you may want to enter later. For example, there are only 12 spaces in "C:\MY-DIR ". If you later change this to "F:\CL501\SOURCE", which is 15 characters long, you will have gone beyond the end of the string and written over something else, possibly something that could cause your application to crash and do generally undesirable things. When making this type of modification using a binary file editor, be careful not to go beyond the boundaries of the literal string you're changing.

Norton's DiskEdit program is well-suited to this kind of quick modification, since it has a search function and requires only 130K of disk space, making it easy to carry around on a floppy disk.

—Sal Ricciardi

Graphics

A HALFTONING PRIMER

❓ Could you please explain exactly what a halftone is? Also, why is resolution measured in dpi in some cases and lpi in others, and what's the difference?

Donald Whittier
Columbus, Ohio

► **PC MAGAZINE:** The best way to start your halftoning education is with a history lesson. In the old days—long before

computers—commercial printers wanted to reproduce the continuous gray tones of photographs, but were faced with the limitation of their media—black ink on white paper. They were able to simulate all the gray values, however, using tiny dots of ink—a process they called halftoning. The dots were small, so the human eye would average them with the white background, interpreting the resulting blur as a shade of gray. Printing the dots in different densities created the illusion of varying shades.

Despite all the technological advances associated with computer graphics, ink is still limited to printing in one unvarying shade on any particular pass—black ink is black ink, regardless of whether it is wet ink on a printing press or dry toner in your laser printer. Thus, reproducing photographs still requires the use of halftones, which are now created with digital rather than mechanical methods. To understand the digital process, you must distinguish between the tiny individual dots produced by the mechanical printing device and the larger aggregate cells (or halftone dots) produced as part of the halftoning process.

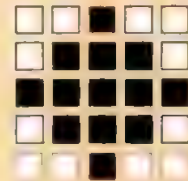
The resolution of a printing device refers to the individual dots and is always measured in dots per inch (dpi). Your desktop laser printer, for example, has a resolution of 300 dpi—90,000 dots per square inch (300-by-300). Newer laser printers (notably the HP LaserJet IV) offer 600-dpi resolution. Professional imagesetters such as the Linotronic or Agfa Compugraphic systems, are capable of 1,270 or 2,540 dots per inch.

Halftone cells refer to the aggregate dots used to simulate gray shades. Halftone cells are printed in angled rows (or lines) in order to avoid a regular dot pattern that in turn helps the optical illusion of dots blending together to form shades of gray. As a result, the resolution of halftone cells is often referred to as a line screen frequency. Therefore the resolution of halftone cells is always measured in lines per inch—or lpi. The lpi setting works in conjunction with the dpi capabilities of the mechanical printing device to determine how many shades of gray you can produce.

Figure 2 demonstrates the relationship between dpi and lpi. Here a modest

Dots and Cells

This represents an individual printer dot (measured in dpi).



Together these dots form a halftone cell (measured in lpi).

Figure 2: This pattern represents a 52 percent gray shade on a 300-dpi laser printer. Fewer black dots in the halftone cell would result in lighter shades of gray; more black dots would result in darker shades of gray (or solid black).

5-by-5 matrix of printer dots forms the halftone cell, creating 25 different densities or gray shades. At 300 dpi, however, your desktop laser printer can produce a maximum of only 60 halftone cells per inch. In truth, when you factor in the typical 45-degree angle (which is used to help the dots blend together optically), the line screen resolution drops to 53 lpi. As a comparison, consider magazines like this one, which are printed at either 120 or 133 lines per inch.

High-end desktop publishing programs—Aldus PageMaker, for example—allow you to control several aspects of the halftoning process. You can use PageMaker's Image Control dialog to specify a screen angle between -360 and 360 degrees, and you can change the screen frequency to any value between 10 and 300 lpi. You can even change the pattern of the halftone cell from a standard dot to a line.

Few users access the functions of the Image Control dialog box, since PageMaker's default settings often yield satisfactory results. For example, if your current output device is a 300-dpi laser printer, PageMaker prints halftones with a dot screen pattern, a 45-degree angle, and a line screen frequency of 53. If you intend to send a project to a service bureau for high-resolution output, you should ask for advice concerning optimum line screen settings.

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Figure 3: PageMaker's halftone controls—available in its Image Control dialog box—let you accurately reproduce photographs or create special effects.

Image Control dialog box (which include brightness and contrast controls) are, for the most part, intended to be used as production tools. As you can see in Figure 3, halftoning functions can be used to create special effects as well. (If you'd like more information on PageMaker's Image Control dialog see "Artful Images with PageMaker," which appeared in the February 23, 1993, Solutions column.)

The picture on the left side represents a typical halftone used when attempting to reproduce a photograph accurately. It was generated on a Linotronic device at 1,270 dpi with a screen frequency of 80 lines per inch and a dot screen pattern at an angle of 45 degrees.

The image on the right throws accuracy to the wind by using PageMaker's halftoning controls to create a special effect. While this image was also produced on a 1,270-dpi Linotronic machine, the screen frequency was dropped to 30 lpi, the screen angle was changed to 90 degrees, and the line pattern was substituted for the normal dot pattern. The difference, as you can see, is dramatic—transforming a scanned photograph into what appears to be a stylized drawing.

The side-by-side pictures in Figure 3 illustrate one other important point about PageMaker's halftoning controls: You can apply different halftone settings to individual pictures within the same document, making it possible to mix and match dramatic special effects using standard photographic reproduction.

—Luisa Simone

Networking

LOST SERVER SPACE

❓ When we run CHKDSK on our LANtastic server, it reports a huge number of "Lost Allocation Units." Recently, CHKDSK reported over 2,000 lost allocation units—over 8MB worth of data space! The system also seems to run slowly. We use an accounting application that is critical to our business, so we need to know what's happening.

*Mike Herndon
Washington, D.C.*

► **PC MAGAZINE:** Lost space is a potential problem for all DOS-based LAN operating systems, and the cure may be right at your fingertips. When you shut down the server by hitting Ctrl-Alt-Del, do you take the time to hit the S for shutdown, and give the program time to work before hitting Ctrl-Alt-Del again? If you don't take time to hit the S, or if you simply shut the server down by hitting the power or reset switches, you may leave scores of application files open. If you have the cache set to cache writes, the cache never gets to flush or, worse, only partially flushes, littering your drive with file fragments. Accounting and database programs keep a lot of files open simultaneously, and just a few hard shutdowns can create real problems. Clearly, the server should have UPS protection.

If you already shut down the server

gracefully every time, you probably have a hardware problem and it could be in the hard drive. The magnetic markers on the drive that define its tracks and sectors get weaker over time and with heavy use. If your drive hasn't been reformatted and has had extensive use for more than a year or so, the heads may be having trouble figuring out where they are on the disk. This could account for both the lost allocation units and the slow performance of the drive.

Reformat the drive at the lowest level you can (but remember not to try a low-level format on IDE drives). Then temporarily get rid of any software write caching. Put CHKDSK in your server's AUTOEXEC.BAT followed by the PAUSE command, so you see CHKDSK's report every time you boot-up. If the problem goes away, reactivate write caching and see what happens.

LANtastic and other DOS-based network operating systems are compatible with defragmenting tools like PC-Kwik and Norton's Speed Disk, and you should use them frequently. The network operating systems also work with disk compression utilities such as Stacker and the disk compression utility in DOS 6.0.

—Frank J. Derfler, Jr.

WIRELESS PRINTER SHARING

❓ Our company's building is a historical landmark. This means we can't cut holes in the walls or mar the floors, but we'd like to be able to share printers. Is there any way to do this without wires?

*Bill Hall
Boston, Massachusetts*

► **PC MAGAZINE:** The fast-evolving wireless networking market offers several high-priced, high-capability options, such as NCR's WaveLAN and Motorola's Altair. But it sounds like you want simpler stuff.

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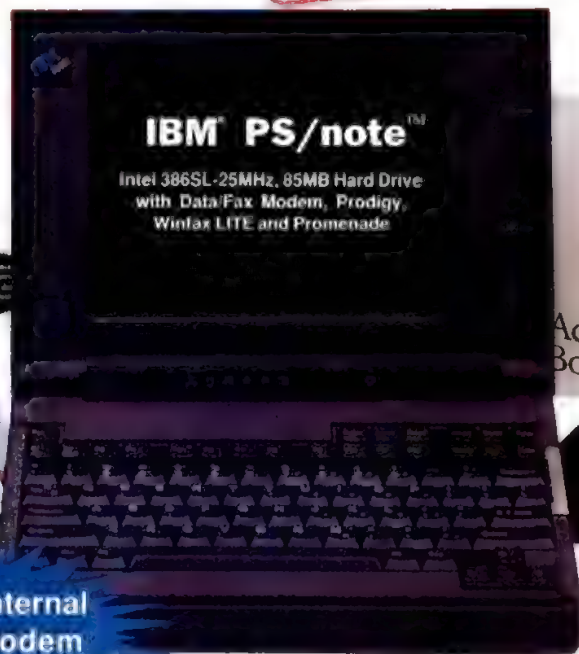
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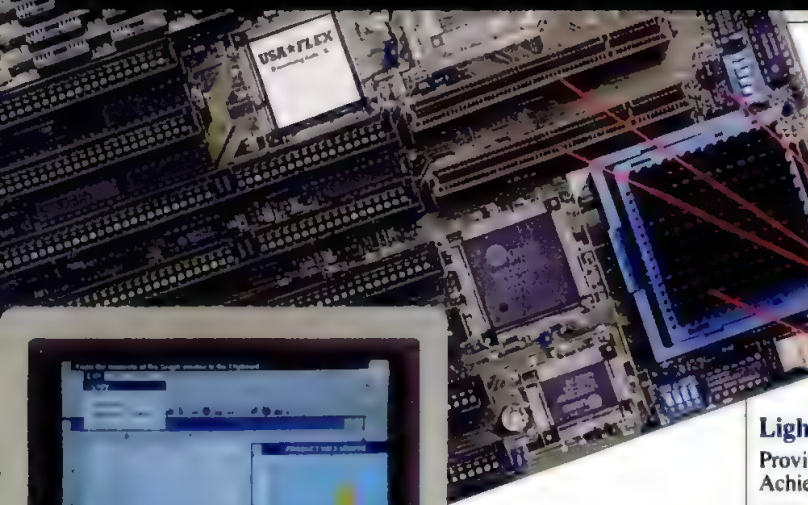
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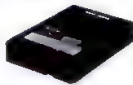


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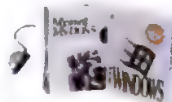
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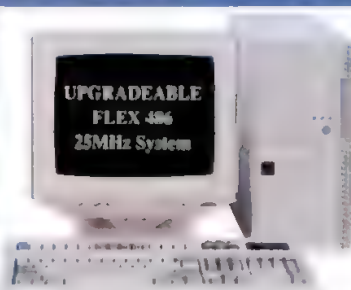
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small transceiver that plugs into the serial port of each node has a suggested retail price of \$500. If you need to extend beyond 100 feet, O'Neill offers a repeater that will retransmit another 100 feet.

A somewhat less-expensive and perhaps less-threatening alternative for those who are shy about working around RF energy is available from Argyle Computer Services (301-236-9513). Argyle's \$299.95 Lambda Link uses infrared light to link computers to printers. The drawback, of course, is that you must have at least a bounce path for the light between the units. The Lambda Link connects to the PC's parallel port and provides a 9,600-bps link to the printer. The transmitter and receiver each have a 32K buffer, so you get out of your applications quickly after initiating the print job. If multiple print jobs come in from different PCs at the same time, they're stored in the buffers at either end.

You don't need any special software for the Lambda Link, so it works with any Apple, PC, midframe, or other computer you can name. If you have a line-of-sight path of 100 feet or less, the Lambda Link is a nice alternative. It's one of those sim-

ple plug-and-play products you always wish for and so rarely seem to get!

—Frank J. Derfler, Jr.

Languages

VERBOSE MESSAGE BOXES

TIP I read with interest Stephen Baugh's description of his Turbo Pascal String object for constructing PChars in the November 10, 1992, issue of *PC Magazine*. Figure 4 is my own solution to the problem of constructing large Message-Box displays.

I pass a Record type argument to `wvsprintf` and construct the Message-Box header and text from strings stored in the application's string table resources. I find it much easier to edit strings using TPW's Resource Workshop text editor option, using a new string for each text line in the message box. The beginning and ending string ID numbers are passed to the `VerboseMessage` function, which allocates memory, reads the strings from the resource table, and edits in any arguments required. The first string in the list

is used for the message box title. The function returns a standard `mb_response` code, or -1 if the memory allocation fails.

I have had considerable difficulty understanding how to use `wvsprintf`. The TPW documentation is obscure and even incorrect in some places, and all of

*The wvsprintf function
can format a truly
remarkable variety of
different data types.*

the supplied example code shows only simple applications. Perhaps you could expand on the uses of `wvsprintf` for the benefit of all us beginners.

Kurt P. Herzog
Grants Pass, Oregon

► **PC MAGAZINE:** The `VerboseMessage` function brings together several features of Turbo Pascal for Windows in a superb synergy. Storing the strings for the message box title and contents in a string re-

VERBOSMB.PAS

Complete Listing

```
Unit VerboSMB;                                (By Kurt Herzog, 06/10/92 vers:10/28/92)
                                              (A unit to facilitate wordy MessageBoxes)

($IFDEF PRODUCTION)
  ($R-)                                     (No range checking)
  ($S-)                                     (No Stack checking)
  ($D-)                                     (No debug data)
  ($L-)                                     (No Local debug symbols)
($ENDIF)
{$X+}

(**) INTERFACE (**)

USES
  Strings,                                  (Null-terminated string support)
  WinTypes,                                (All standard Windows types)
  WinProcs;                                (Defines Func/Proc headers for API)

FUNCTION VerboseMessage
  (hParent : HWND;                          (Parent window handle)
   First,   (ID of first string (box title))
   Last : word;                             (ID of last string in series)
   VAR ArgList; (table of wvsprintf arguments)
   mbConst : word; (mb_constants)
   : integer; (returns mb_response or -1)
              (if unable to allocate memory)

(**) IMPLEMENTATION (**)

FUNCTION VerboseMessage (hParent : HWND; First, Last : word;
                        VAR ArgList; mbConst : word) : integer;

TYPE
  PBuffer = ^TBuffer;
  TBuffer = RECORD
    Areal : ARRAY[0..1023] OF Char; (Max size for wvsprintf)
    Area2 : ARRAY[0..1023] OF Char;
  END;
  VAR
    WorkBuffer : PBuffer;
    Maintext : PChar;
    Stringnumber : word;

    StringsSize : Integer;
  BEGIN
    GetMem(WorkBuffer, SizeOf(TBuffer));
    IF WorkBuffer = nil THEN
      BEGIN
        VerboseMessage := -1;
        Exit;
      END;
    WITH WorkBuffer^ DO
      BEGIN
        Area2[0] := Chr(0); (Init to no data)
        FOR Stringnumber := First TO Last DO
          BEGIN
            StringsSize := LoadString(HInstance, Stringnumber,
                                       Areal, SizeOf(Areal)-1);
            IF StringsSize <> 0 THEN (Ignore missing string numbers)
              BEGIN
                StrLCat(Areal2, Areal, SizeOf(Areal2)-1);
                StrLCat(Areal2, Chr(13), SizeOf(Areal2)-1); (CR @ end)
              END;
            END;
            (Edit in any argument parameters)
            wvsprintf(Areal, Areal2, ArgList);
            (Replace 1st CR with null to terminate box title,)
            (then set main text pointer to data following box title)
            Maintext := StrScan(Areal, Chr(13));
            IF Maintext <> nil THEN
              BEGIN
                Maintext[0] := Chr(0);
                Maintext := @Maintext[1];
              END;
            VerboseMessage := MessageBox(hParent, Maintext, Areal,
                                         mbConst);
            FreeMem(WorkBuffer, SizeOf(TBuffer));
          END;
        END;
      END;
    END.
```



Figure 4: The `VerboseMessage` function handles multiline message box displays with replaceable parameters.



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VBMBTEST.PAS

Complete Listing

```

Program VbMbTest;           (By Kurt Herzog, 6/18/92)
{$R VBMB.RES}
USES
  VerboseMB,               (Verbose MessageBox Unit)
  Strings,                 (Nul-terminated string support)
  WinTypes,               (Defines Windows API for Pascal)
  WinProcs,               (Defines Func/Proc headers for API)
  ($IFDEF VER70)
  OWindows,               (Defines standard window Object types)
  ODialogs,               (Defines standard dialog Object types)
  ($ELSE)
  WObjects,               (Defines all standard Object types)
  ($ENDIF)

CONST
  id_Tfirst = 001;        (String table IDs)
  id_Tlast  = 015;

TYPE
  ThisApplication = OBJECT(TApplication)
    PROCEDURE InitMainWindow; virtual;
  END;

  PTestWindow = ^TestWindow;
  TestWindow = OBJECT(TWindow)
    PROCEDURE WmLButtonUp(VAR Msg : TMessage); Virtual
      Wm_First + Wm_LButtonUp;
  END;

  PROCEDURE TestWindow.WmLButtonUp(VAR msg : TMessage);
  VAR
    args      : RECORD
      StringArg : PChar;
      LongIntArg : LongInt;
      AnotherStr : PChar;
      CharArg : Char;
      filler : Char;
      IntArg : integer;
    END;
  BEGIN
    args.StringArg := '<< Insert this String >>';
    args.LongIntArg := GetTickCount;
    args.AnotherStr := 'Another string';
    args.CharArg := 'r';
    args.IntArg := -256;
    VerboseMessage (HWindow, id_Tfirst, id_Tlast, args, mb_Ok);
  END;

  PROCEDURE ThisApplication.InitMainWindow;
  BEGIN
    MainWindow := New(PTestWindow, Init(nil,
      'Click for VerboseMB Test'));
  END;

VAR ThisApp: ThisApplication;
BEGIN
  ThisApp.Init('VbMbTest');
  ThisApp.Run;
  ThisApp.Done;
END.

```



Figure 5: This program tests the VerboseMessage function. Left-click on it to see an example verbose message box.

source makes it easier to change them—even to translate them to another language—without changing the program. And letting them contain `wvsprintf` format specifiers, replaced by actual values at runtime, makes this function much more flexible than the `MessageBox` API function.

`VerboseMessage` starts by creating a work buffer and loading it with all of the strings whose ID numbers fall in the specified range from the program's string resource, inserting a carriage return at the end of each string. It calls `wvsprintf` to process the record variable pointed to by the `VAR` parameter `ArgList`, inserting data from this record into the output string according to format specifiers imbedded in the strings from the resource. Finally it calls the `MessageBox` API function, passing the first string as

the box title and the rest as its contents.

Figure 5 is an example program that uses the `VerboseMessage` function, and Figure 6 is the resource script. Run it and left-click anywhere in the client area to bring up a sample verbose message box. In this example, only the millisecond count in the first line changes, but actually any and all of the replaceable format specifiers could change between invocations of the message box.

Version 1.0 of Turbo Pascal for Windows accidentally omitted the format specifiers for the `wvsprintf` function from its on-line help and its printed manual. TPW 1.5 and Borland Pascal 7.0 include the format specifiers in on-line help; the discussion is very complete and is well worth study. In short, the `wvsprintf` function is used for formatting text with data of various types. It

takes three parameters, a destination buffer, a format string, and a pointer to an unspecified number of arguments. `wvsprintf` steps through the format string from left to right, copying its characters to the destination buffer. However, any time it hits a *format specifier* in the string, it takes the next 2- or 4-byte quantity from the argument list and formats it as specified, storing the result in the destination buffer.

Format specifiers always begin with a percent sign and end with a character defining the data type. For example, the format specifier `%u` causes `wvsprintf` to grab the next 2-byte quantity and format it as an unsigned integer, and `%s` causes `wvsprintf` to treat the next 4-byte quantity as a `PChar`. Modifiers between the percent and the type characters control the output width, whether the data is padded on the left or the right, and the way hexadecimal numbers are represented, among other things. For example, the specifier `%08lX` formats the next 4-byte quantity as an 8-digit hex number padded on the left with zeros. As the `VbMbTest` program demonstrates, `wvsprintf` can format a remarkable variety of different data types.

All files mentioned here can be downloaded from PC MagNet, archived as `VERBOS.ZIP`.—Neil J. Rubenking □

VBMB.RC

Complete Listing

```

STRINGTABLE
BEGIN
  1, "MESSAGEBOX %s CAPTION"
  2, "Milliseconds since Windows started: %li"
  3, "%s <--- another inserted string"
  4, "The character 'r' inserted in the middle of the last word."
  6, "No inserts in this line"
  9, "%d = signed decimal integer"
  15, "This line ends the test with no insertions"
END

```

END



Figure 6: The `VbMbTest` program gets the strings for its verbose message box from this string resource.



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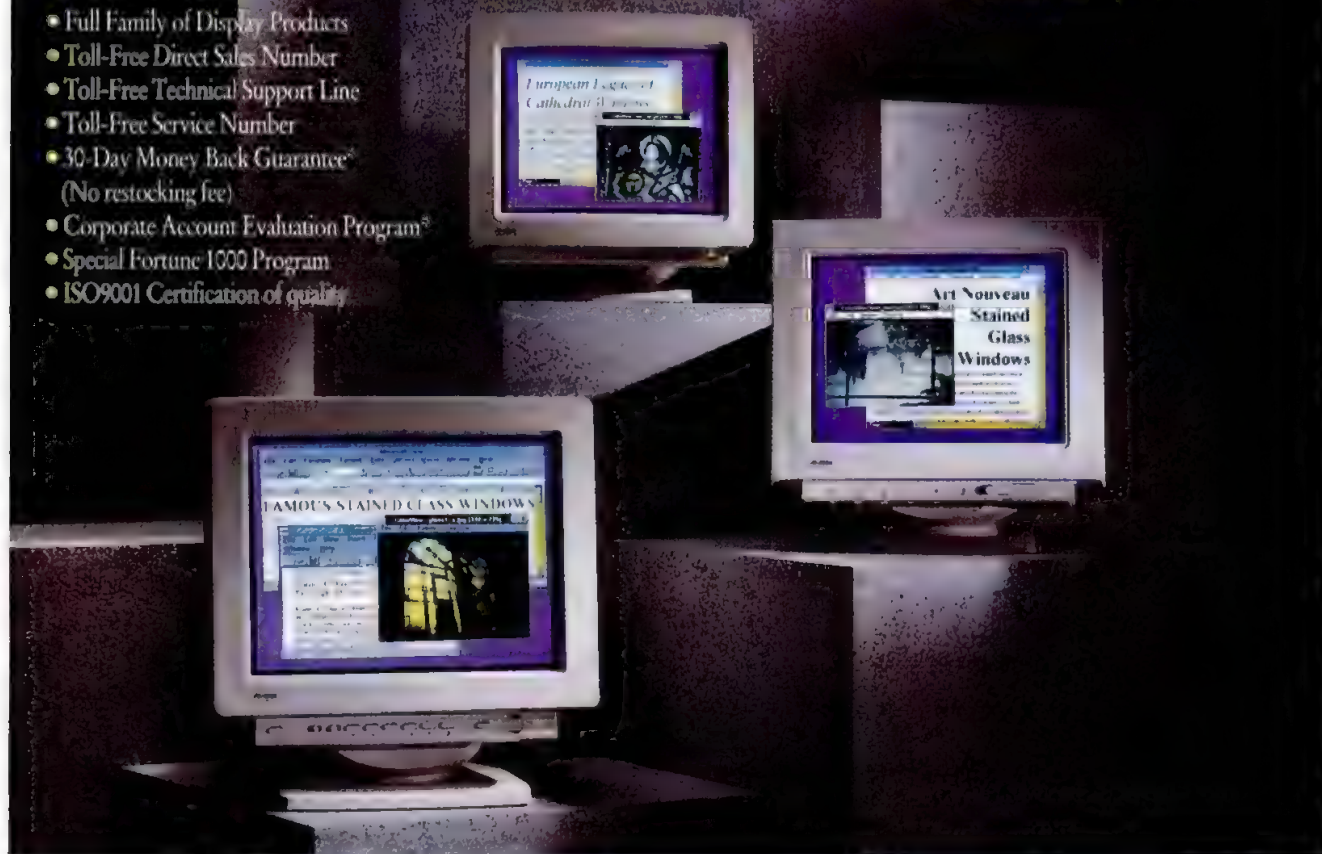
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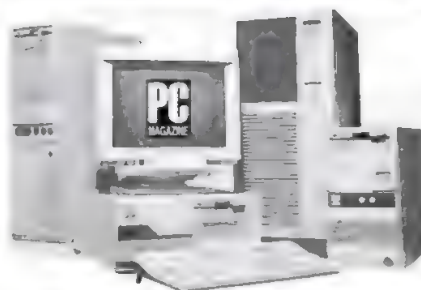
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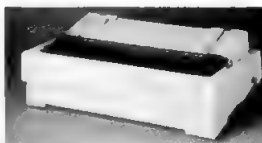
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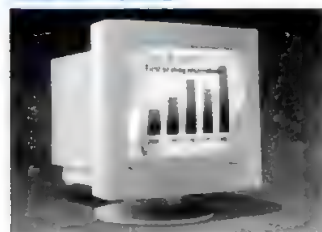
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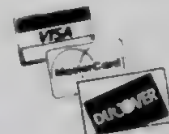
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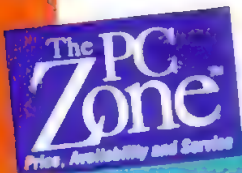


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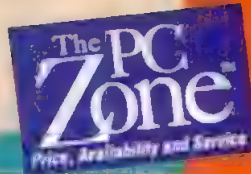
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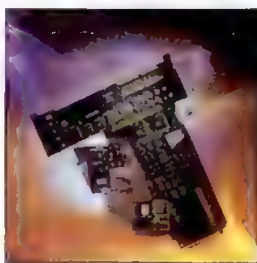
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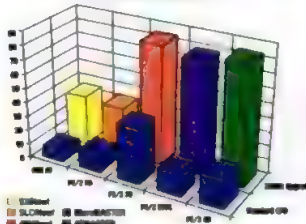
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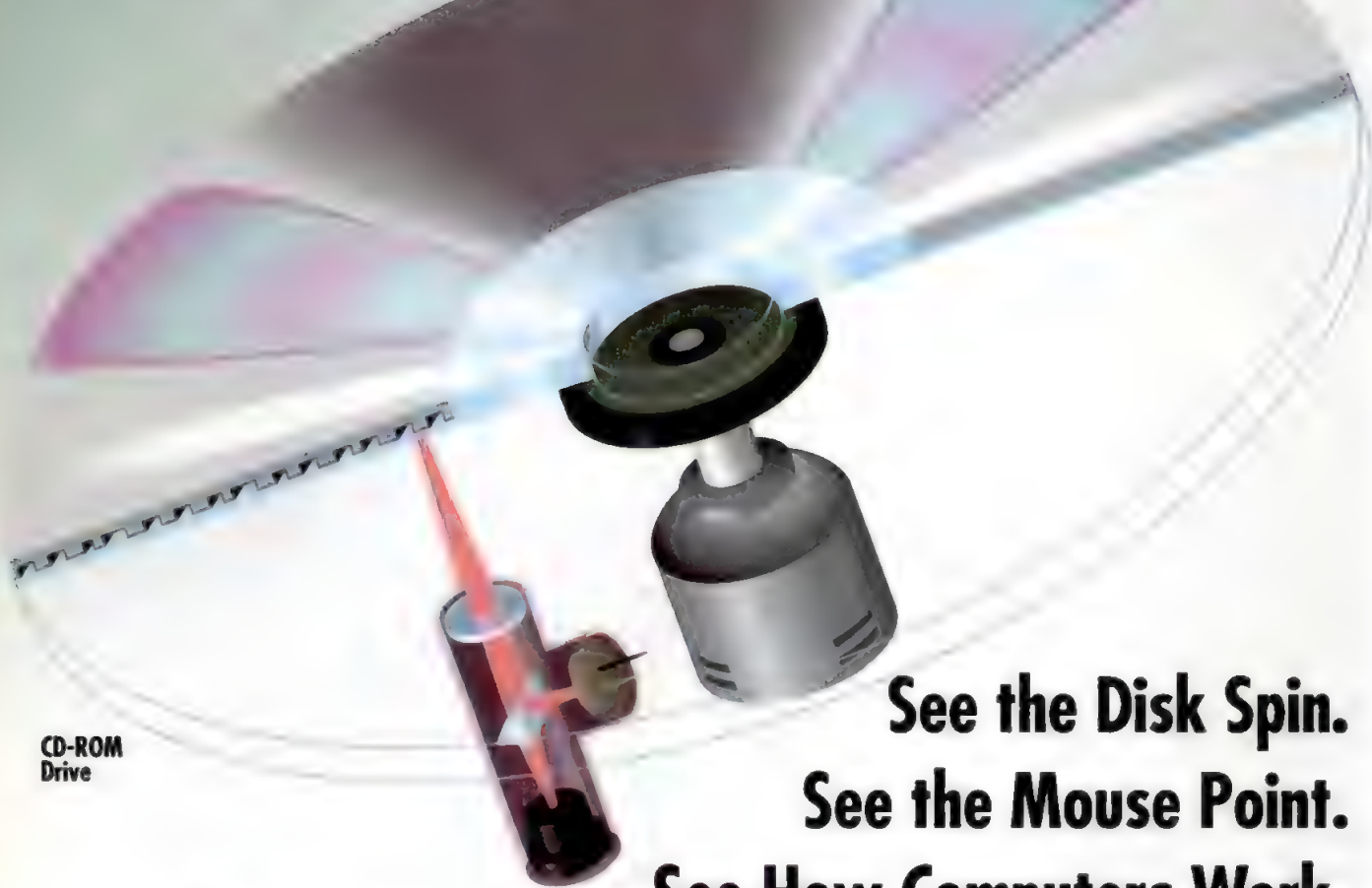


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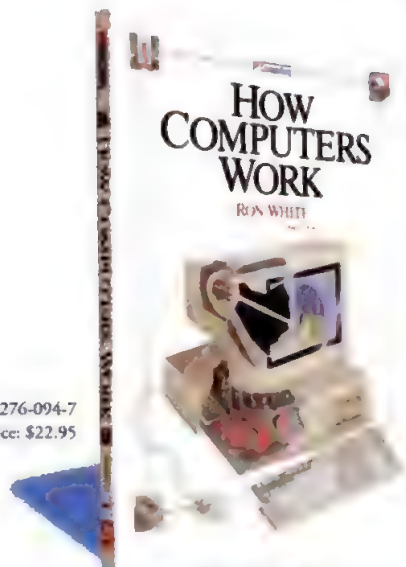
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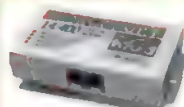


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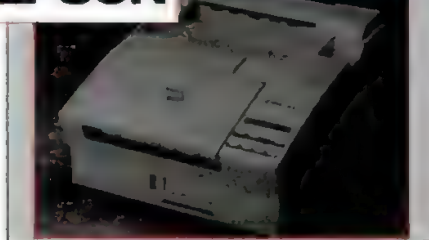
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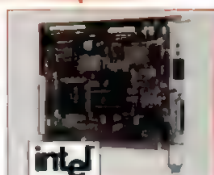
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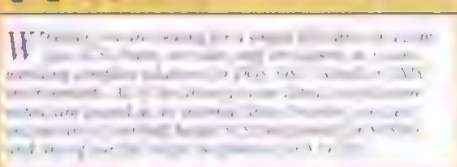
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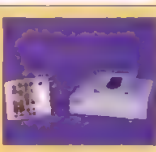
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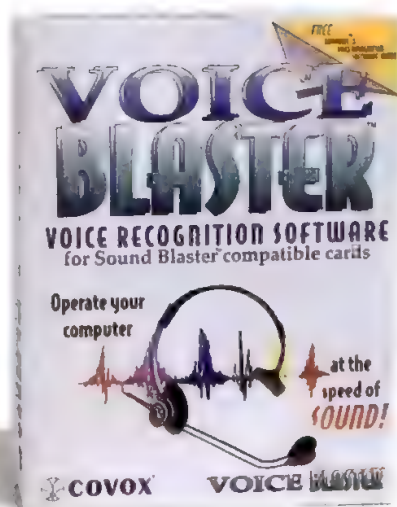
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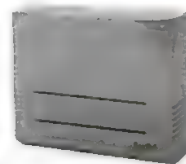
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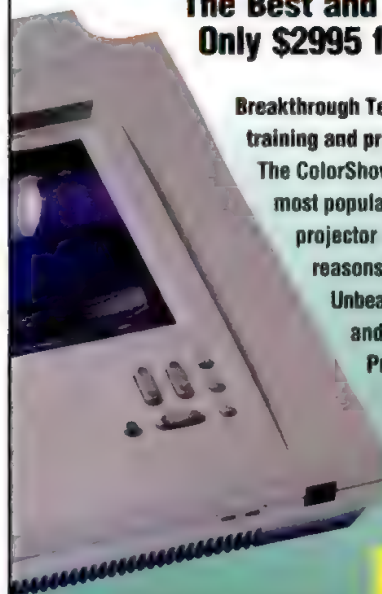
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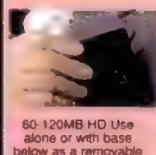
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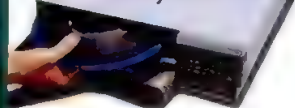
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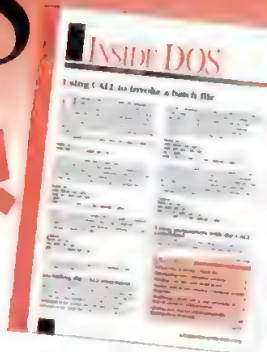
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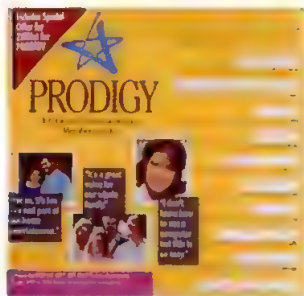
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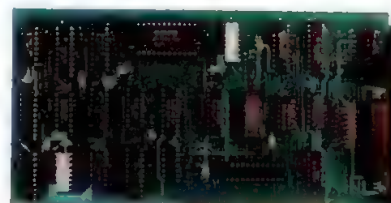
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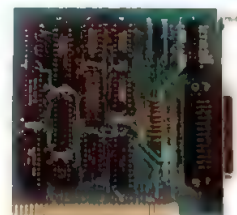
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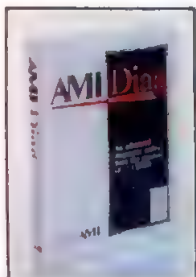
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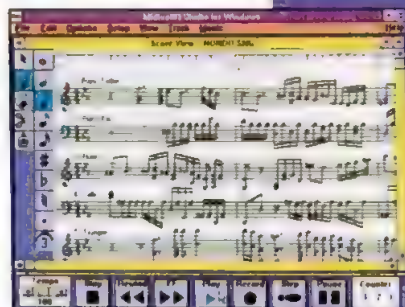
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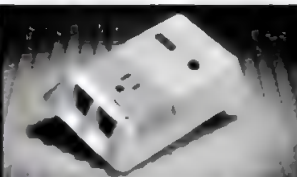
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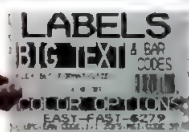
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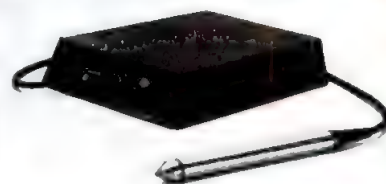
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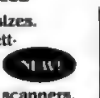
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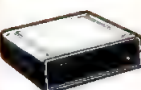
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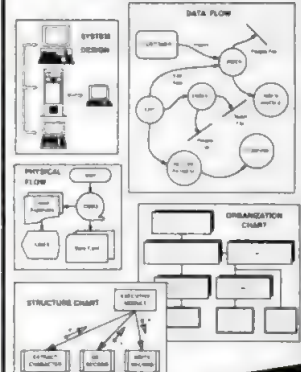
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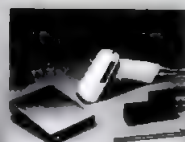
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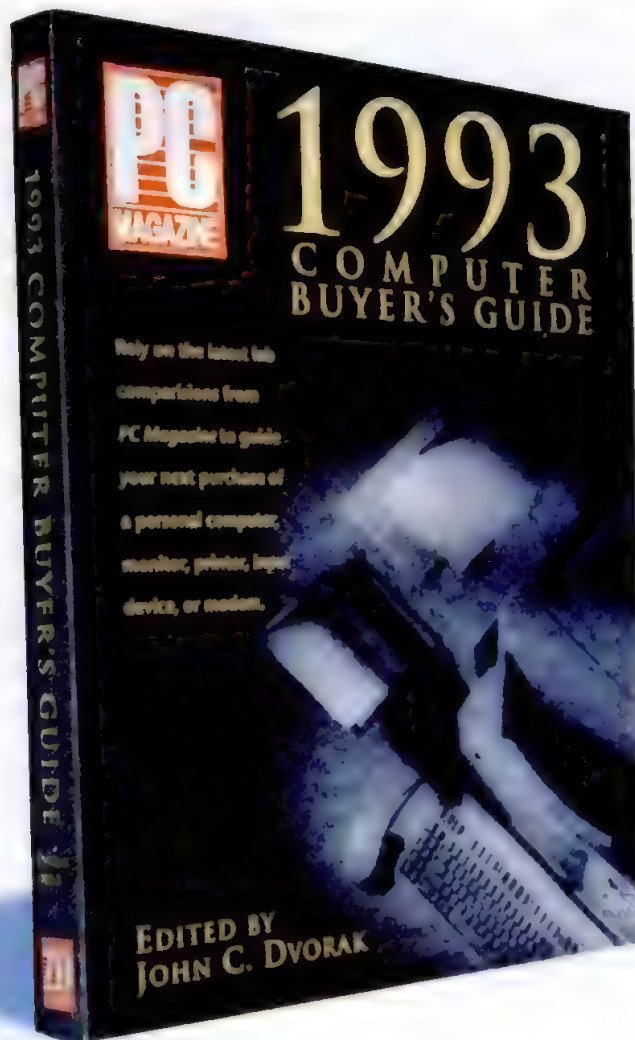
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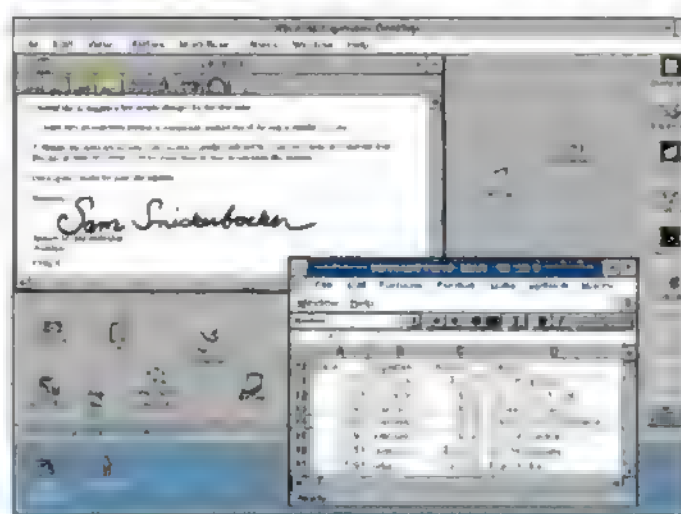
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Coming Up

Workstation Platforms

The market dominance of machines based on Intel chips is being challenged by alternative platforms (mainly RISC). New operating systems also are emerging (such as Microsoft Windows NT) and are being ported to multiple platforms. The abundance of platform choices will give users a broader array of computing possibilities. PC Magazine Labs tests six systems (the Apple Macintosh Quadra 800, the Pentium-based Compaq Deskpro 5/66M Model 510, the HP Apollo 9000 Model 715/50, the IBM RS/6000 PowerStation 365, Silicon Graphics' IRIS Indigo R4000 XZ, and the Sun SPARCstation LX) as they perform typical workstation tasks.

Special Report: Groupware



Portfolio Technologies' Office.IQ is one of the products we'll look at in our groupware roundup.

PC applications designed to enable, facilitate, and improve interactions among members of the modern-day entity known as the workgroup are finally appearing in force. In a software special report, we look at the best of a maverick group of products.

Unix on Intel

So you're ready to decide on a 32-bit operating system that will take your organization into the next century. OS/2 or Microsoft Windows NT, right? If it were only that simple! Traditionally relegated to academia and vertical turnkey systems, Unix vendors are launching a frontal attack on mainstream markets, and there is unity in the once fragmented world of Unix. We'll look at whether graphical Unix products running on Intel chips pose a real challenge to OS/2 and Windows NT in the battle for the desktop.

Free Utility

Next issue's utility, ANIMATOR, lets you animate your Windows icons. First, create your images using your favorite icon editor. Then use ANIMATOR to create a script or animation sequence and link it to a particular executable. The next time you minimize your application, you'll see the animated icon. □

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CHILDREN'S SOFTWARE

Five Edutainment Programs Teach Young Children Basic Skills

BY CAROL ELLISON AND
CHARLES TAFT

Many children master the mouse before they can read. Now there's software just for them. The five programs in this review will grab almost any kindergartner's attention and teach basic reading, writing, and math skills while they play. These packages—from Broderbund Software, Davidson & Associates, Edmark Corp., Knowledge Adventure, and newcomer Bright Star Technology—are some of the most entertaining and educational programs on the market. (To keep kids out of mom and dad's files, try Edmark's KidDesk, which lets you set up a Windows-like desktop that gives kids access to only the programs you choose.)

BRODERBUND SOFTWARE INC.

Living Books

There's something truly special about watching children read books by themselves. Now imagine the child's delight if the book is on CD-ROM, and there are moving things to explore on every page. Just Grandma and Me and Arthur's Teacher Trouble, Broderbund Software's first two releases in its Living Books series of interactive sto-

rybooks, bring popular children's stories to the computer screen with music, animation, multilingual narration, and a host of activities.

Just Grandma and Me is rated for ages three to eight, but every member of the family will delight in the humor and discoveries in the program. It opens with its jaunty theme music, and the story's main character, Little Critter, greets you and introduces you to the software. On the opening screen, you select the language in which you want to hear and read the story—English, Japanese, or Spanish. Little Critter points out the options: "Click on this button to play inside the story." or "Click on this button to have the story read to you." (There's no option to let the child read each page before the program narrates.)

If you have the story read to you, you hear Mercer Mayer's enchanting tale of the afternoon excursion Little Critter and his grandmother take to the beach. You see text from the story on-screen, hear it read in Little Critter's kiddy

voice, and follow the animated action as the two board the bus to the beach, frolic at the ocean, and return home late at night.

Choose to "play inside the story" and that's exactly what you get to do. Each screen of Just Grandma and Me is a page out of Mercer Mayer's book, with animated illustrations that duplicate what you will find in the bound copy of the Golden Book, which Broderbund includes with the software.

The text is identical to that of the book. But a child can play with it by clicking on words and phrases to have them spoken one at a time. And, unlike the book, all

Grandma converse with other characters in the scenes. It's the conversational asides from the story, along with the abundance of charming animated activities, that make Just Grandma and Me on CD-ROM so delightful.



Arthur's Teacher Trouble has the same delightful interface as Just Grandma and Me.



Just Grandma and Me: A children's favorite gets interactive CD treatment.

of the characters on the computer screen are fully interactive. Starfish come to life to tap dance, pirouette, or do aerobics when you click on them. And Little Critter and

ARTHUR'S TEACHER TROUBLE

Arthur's Teacher Trouble, the second CD-ROM in the Living Book Series, addresses a slightly older audience (children ages six to ten), yet the program has the same charm of Just Grandma and Me. Author Marc Brown's familiar story of Arthur the Aardvark comes to life with splendid animations, engaging interactions, entertaining music, and multiple-voice narration.

Arthur's Teacher Trouble tells the story of Arthur's third grade class, taught by Mr. Ratburn, who's known to be a really tough teacher: He gives homework on the first day of school! As if daily homework weren't enough, Arthur's been selected to be a class representative in the school's September spelling bee. Arthur studies hard for the

Living Books

event; he spends many nights practicing spelling words, and his family helps him prepare.

FLYING HIGH

As with *Just Grandma and Me*, the program offers a multitude of interactive treasures. Touch virtually any item or person on any page, and you'll be rewarded with animated activity. Click on the "learn to fly" offer on the bulletin board, for instance, and it folds into an airplane, flies off the page, and returns for unscheduled visits throughout the story. Click on a batch of freshly baked cookies, and they'll harmonize and sing a song.

Children will find the story delightful, and parents will appreciate the values it helps teach. As children join Arthur and his friends on their adventures at school, they're shown the way to success is through hard work and practice.

Broderbund's *Living Books* are the PC's answer to the tradition of big-screen animated films that pack enough humor to tickle adults as they entertain children. The two programs teach as they entertain and let children become players in the storybooks they are reading. *Just Grandma and Me* and *Arthur's Teacher Trouble* offer reason enough to purchase a CD player if you don't already have one.

Just Grandma and Me, Arthur's Teacher Trouble, \$39.95–\$54.95 each. Requires: Multimedia PC with CD-ROM drive and sound card, 4MB RAM, 256-color Super VGA display, Microsoft Windows 3.0 with Multimedia Extensions or Windows 3.1. Broderbund Software Inc., 500 Redwood Blvd., P.O. Box

6121, Novato, CA 94948-6121; 800-521-6263, 415-382-4400; fax, 415-382-4582.

Circle 456 on reader service card

BRIGHT STAR TECHNOLOGY

Alphabet Blocks

Alphabet Blocks is the electronic answer to those wooden alphabet blocks you may have had as a child. Unlike those toys, however, this game talks, plays music and sound effects, and produces dancing characters to entertain as it reinforces early language skills. Developed by Bright Star Technology, Alphabet Blocks is the latest in Sierra On-Line's Discovery Series of educational games for young children three and up.

Alphabet Blocks presents your child with two computer coaches: Jack, a giggling jack-in-the-box, and Bananas, a

second, Jack names a letter and asks the child to identify it. Bananas hosts the third game, in which the child must identify the letters by sound ("ba" for *b* and "ka" for *c*, for instance). In the fourth and most advanced game, the chimp draws three pictures on the blackboard and asks which picture begins with a specific letter sound.

Children can change the case of the letters from upper to lower by clicking on the toy soldier and changing his position from standing to sitting. If, instead of playing the game, they just want to explore, they can click on the blocks to hear Bananas speak the sounds and Jack name the letter.

Bright Star made this game infinitely patient and always encouraging. With every correct answer, the program rewards the child with a tiny

banana or jack-in-the-box and a car or a dancing animal that scoots across the bottom of the screen. If a child gives the wrong answer, the program simply narrows the choices until, eventually, only the right letter remains.

Parents can customize the program to present the blocks in alphabetical order or scrambled; to teach only sound, only letters, or both; to present the letters in block or cursive style; to turn off the music; and even to put a combination code on the panel to customize the program so that children cannot change the options once they're set. And although it's designed for individual play, the manual packs suggestions for fun family activities adults

can create to supplement the lessons.

If you're teaching your kids their ABC's or beginning to introduce them to simple words that use letters and sounds, Alphabet Blocks is a program you should not miss. Its excellent use of sound and animation makes it an interactive learning experience and as much fun as Saturday morning TV.—C.E.

Alphabet Blocks, \$49.95.

Requires: 4MB RAM, 7MB hard disk space, 256-color VGA display, Windows 3.1-compatible sound card with DAC, Microsoft Windows 3.1. Bright Star Technology, a subsidiary of Sierra On-Line Inc., P.O. Box 485, Coarsegold, CA 93614; 209-683-4468, 800-326-6654; fax, 209-683-3633.

Circle 457 on reader service card

DAVIDSON & ASSOCIATES INC.

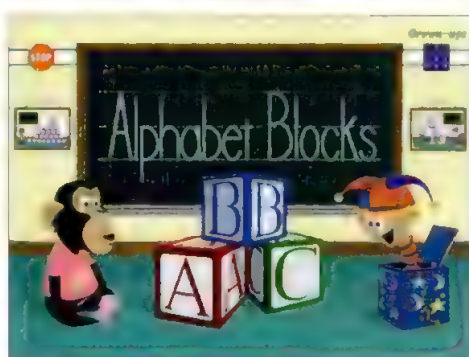
Kid Works 2

There are some good writing programs and some good drawing programs, but there are few that combine the two and make them accessible to kids. That's where *Kid Works 2* comes in. With this package, kids can write, illustrate, print, and listen to their own stories.

Children ages four to ten will feel comfortable the minute they come to the main screen, where a child's room of animated toys beckons you in.

The four main features of *Kid Works 2* are clearly visible and labeled: Story Writer, Story Illustrator, Story Player, and Icon Maker. Children use the first two to create and illustrate their stories and play them back using Story Player.

Story Writer is essentially a simple word processor with a few special options: Children can choose to type with large



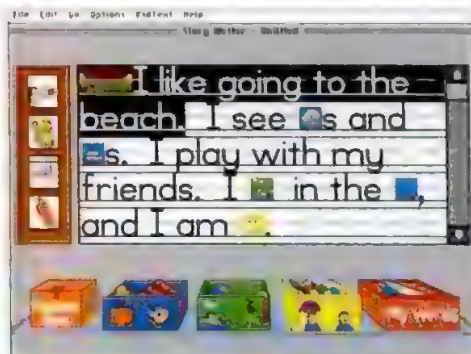
Read their lips: Bananas and Jack coach children as they practice early reading skills with Alphabet Blocks.

lovable chimp. Both characters articulate and move their lips in sync with each sound—no easy technological feat.

Jack and Bananas appear on-screen in playroom settings, complete with blocks, blackboards, toy soldiers, and other toys. Each character hosts two games of increasing difficulty. In the first, for early learners, Jack draws a letter on the blackboard and asks the child to click on the block that contains the same letter. In the

Kid Works 2

or small letters, and they may substitute one of 250 icons for any word. Story Illustrator is



Kids write and illustrate their own stories, using text, pictures, and icons, with Kid Works 2.

a simple paint program with tools made just for kids. Drawing tools include a box of 16 crayons, a typewriter, a ruler, and stamps.

Story Illustrator offers children two other ways to create their own pictures. They can select full-size line drawings (of a beach, a cityscape, or a farm, for instance) from the program's Coloring Book option, color these pictures, and then save them to their picture box for future use. Story Illustrator also has a powerful import facility that will resize or crop-to-center any .PCX file that's too large to load in its entirety. The program doesn't offer a "zoom" feature for editing the illustrations, however; younger artists may have some difficulty touching up their creations.

Kid Works 2 features pull-down menus and a well-written user manual that contains program instructions, sample creations, and a helpful tips section for parents and teachers. The program offers cut, copy, and paste options as well as a printing option; you can print out your stories for future storytelling.

Kid Works 2 can also con-

vert text to speech and read back a child's story phonetically. Correct spelling isn't an issue. Context-sensitive on-line help is available, and for prereaders, the program can read the help screens aloud.
—C.T.

Kid Works 2,
\$59.95.

Requires: 640K
RAM, 7MB
hard disk space,
DOS 3.3 or later.
Sound card
optional.

Davidson &

Associates Inc., P.O. Box
2961, Torrance, CA 90509;
800-545-7677, 310-793-0600;
fax, 310-534-3169.

Circle 458 on reader service card

EDMARK CORP.

Millie's Math House

Little kids will love Millie's Math House. Millie is an animated cow who invites children to participate in various activities in her house and introduces them to basic skills like counting and matching.

Millie's Math House has six activity centers, each of which focuses on early math skills, and is suitable for children ages two to six. Children learn to identify sizes, shapes, patterns, and numerals and develop useful skills such as problem solving, planning, and counting. Along the way, they'll build a bug reminiscent of a Cootie gone mad and meet characters such as Frank Lloyd Mouse; Harley, the cookie-eat-

ing horse; and Bing & Boing, a pair of bouncing pals who teach kids to recognize patterns.

The program offers children two ways to play. In the Explore and Discover mode, kids can experiment on their own. In the Question and Answer mode, they follow specific requests and complete tasks. Switching between modes takes just a click of the mouse.

POSITIVE REINFORCEMENT

Millie's activities offer combinations of animations, music, and voices that encourage learning, and parents will notice immediately that Millie's Math House is supportive. If a child makes a wrong decision, he or she is corrected in a gentle, nonthreatening way and encouraged to continue. Correct actions are rewarded with animations and audio reinforcement. When children select the requested number in the Number Machine activity, they're rewarded with animated entertainment featuring that number of characters.

The program's on-line Adult Section, accessible via a keystroke combination, includes notebooks with information on each of Millie's six topics. Each notebook contains a description and directions for the game, suggestions for group and individual activ-



Remember Cootie? Millie's Math House teaches kids to count as they create their own bugs.

ities, and a section designed to help parents develop realistic expectations for their children. Certain activities have special options: Millie's offers families with sound cards the ability to record their own sounds and voices for use by each of the characters in Bing & Boing and each bug in Build-A-Bug, and Build-A-Bug and Mouse House enable children to print out their creations for further play.—C.T.

Millie's Math House, \$49.95.

Requires: 640K RAM, 2.8MB
hard disk space, DOS 3.0 or
later. Sound card optional.
Edmark Corp., 6727 185th
Ave. NE, P.O. Box 3218,
Redmond, WA 98073-3218;
800-426-0856, 206-556-8400;
fax, 206-861-8998.

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KNOWLEDGE ADVENTURE INC.

Dinosaur Adventure

You may not know your pteranodon from your tyrannosaurus, but after playing with Dinosaur Adventure, your child will. The full-motion videos, digitized photographs, and stereophonic sounds make dinosaurs come alive on your computer screen.

Dinosaur Adventure is the fifth program in Knowledge Adventure's Interactive Books series, and it continues the company's tradition of exciting graphics, superlative data compression and retrieval, and varied and interesting facts. (Did you know that the 45-foot-long, 7-ton tyrannosaurus was capable of running up to 40 mph, or that dinosaur eggs were discovered in 1922 in the Gobi Desert?)

The program offers five activity centers, including a hyperlinked dinosaur-history activity section, two matching games, a talking book, and a



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Dinosaur Adventure

separate viewing area for its six full-motion videos.

FIRST ADVENTURE

Knowledge Adventure could have named this product My First Adventure, since it's geared for children as young as three years old. To reach these young dinosaur fans, Dinosaur Adventure includes two matching games and a 12-page talking storybook. The pro-



Dinosaur Adventure: prehistoric fun for dinosaur fans of all ages.

gram reads the book aloud page by page, but young users and their parents can choose a word or phrase and have it repeated, select a picture and hear the dinosaur's name spoken aloud, and turn the book's pages as they choose.

The two matching games, Name-A-Saurus and Read-A-Saurus, challenge users to match the dinosaur's name to the correct picture and the dinosaur's picture to the correct name, respectively, and provide assistance when needed.

Users of other products in Knowledge Adventure's line will recognize the screen layout of the Dinosaur Adventure history activity. The rotating globe, scrollable text files, large high-resolution graphics, adjustable time line, and button bars all enable users to choose areas of interest and present information in many ways.

You can select broad topic areas from the button bar (including Earth, Early Life, Herbivore, Carnivore, Mammals, Fossils, and History) and scroll through the information relating to those categories. You can use the time line to group facts by time (from 15 billion years ago to the present) or by the weight or height of the dinosaurs. Selecting either the high or low end of the weight filter will introduce you to the 100-foot-long diplodocus or the 5-inch megazostrodon.

Many of the graphics and text portions of the history activity are hyperlinked to other topics. A simple click of the mouse enables users to jump from one point of interest to another.

The program offers superlative animation. You can be exploring Herbivore screens and text and suddenly find yourself face to face with a long-necked brontosaurus who begins to move toward you while letting loose a throaty roar. No matter what you've just read in the text window about the brontosaurus being a plant eater, you could still get a bit nervous here. The program contains a large number of facts that will entertain and teach both younger and older users alike.—C.T.

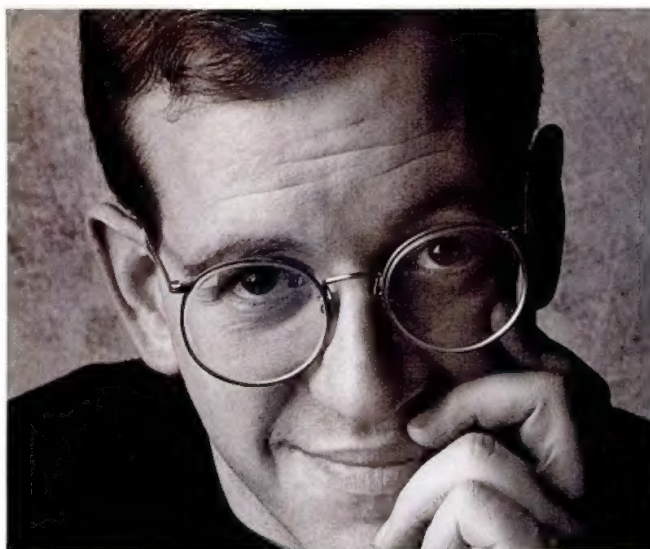
Dinosaur Adventure, \$49.95. Requires: 640K RAM, 5MB hard disk space, DOS 3.0 or later. Knowledge Adventure Inc., 4502 Dyer St., La Crescenta, CA 91214; 800-542-4240, 818-542-4200; fax, 818-542-4205.

Circle 460 on reader service card

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THE LIGHTER SIDE OF PERSONAL COMPUTING

By Robin Raskin

I Second That Emoticon

● If the basic range of e-mail emoticons doesn't reach out far enough, try these:

[:]	User is a robot.
%-)	User has been staring at a green screen for 15 hours straight.
%-6	User is brain-dead.
:-[	User is a vampire.
:-E	User is a bucktoothed vampire.
:-F	User is a bucktoothed vampire with one tooth missing.

If you're clueless about emoticons, turn the page sideways for a more graphic look. (Source: Internet's Unofficial Smilie Dictionary.)



The Personal Terminator

If you loved the movie, you will want the kit. The Robix RCS-6 Construction System, from Advanced Design, is PC-controlled (602-544-2390).

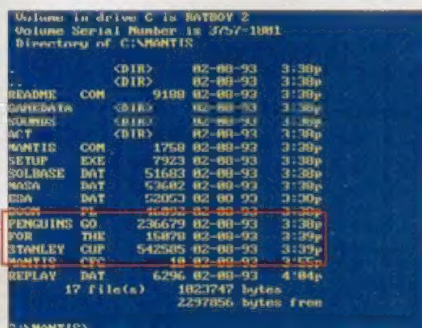
BUZZWORD WATCH

human interaction boundary condition

The point at which speed doesn't count anymore. (*Human interaction boundary condition* is a term originally used by designers of fighter aircraft once they discovered that the planes they were designing flew so fast that pilots couldn't control them.)

First Heard: Dan Classon, Borland International, in a discussion about database testing.

PDA Sure, sure, you think it means *Personal Digital Assistant*, but *The Washington Post* may have called it right. In a recent column, the paper claims that PDA stands for *Probably Disappointed Again*.



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- Dirty Marker
- Feather Tip
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Go Forth and Replicate

Lotus top brass, overheard at the Notes 3.0 launch:

"Do you mind if I replicate while we talk?"

"Do you do little-man or big-man replication?"



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Sidney Harris



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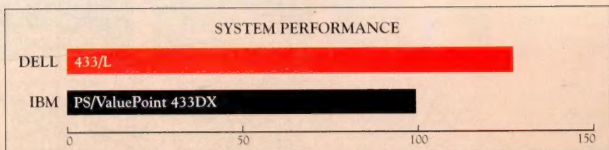
10 YEARS AGO IN PC MAGAZINE

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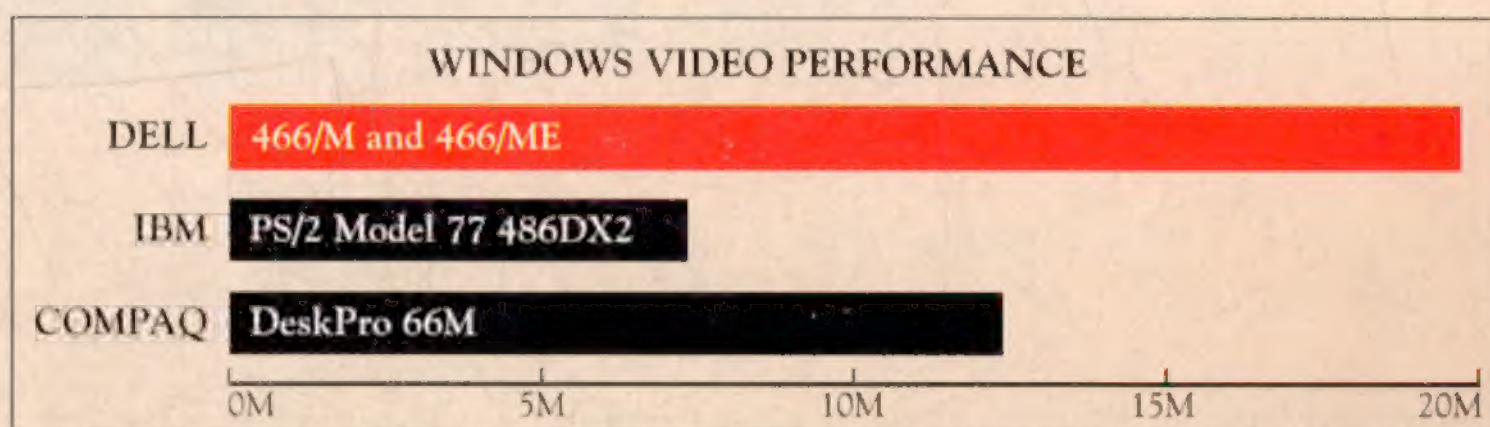
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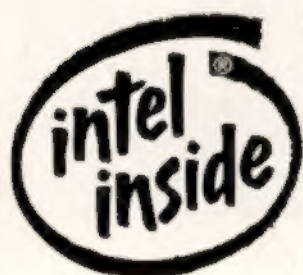


Performance measured by running WINBENCH version 3.1 at 640 x 480, 256 colors. Results measured in millions of WINMARKS. Results for IBM and Compaq as published by PC Magazine in issue dated January 26, 1993. Results for Dell 466/M and 466/ME provided by Dell Performance Measurement Lab, January 1993. DeskPro 66M configured with 8MB RAM, 210MB IDE HD, QVision 1024/E controller with 1MB VRAM. PS/2 model 77 486DX2 configured with 8MB RAM, 400MB SCSI HD, XGA-2 with 1MB VRAM and 256KB cache. 466/M and 466/ME both configured with 8MB RAM, 170MB IDE HD, local bus video with 1MB VRAM, and 128KB cache.

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